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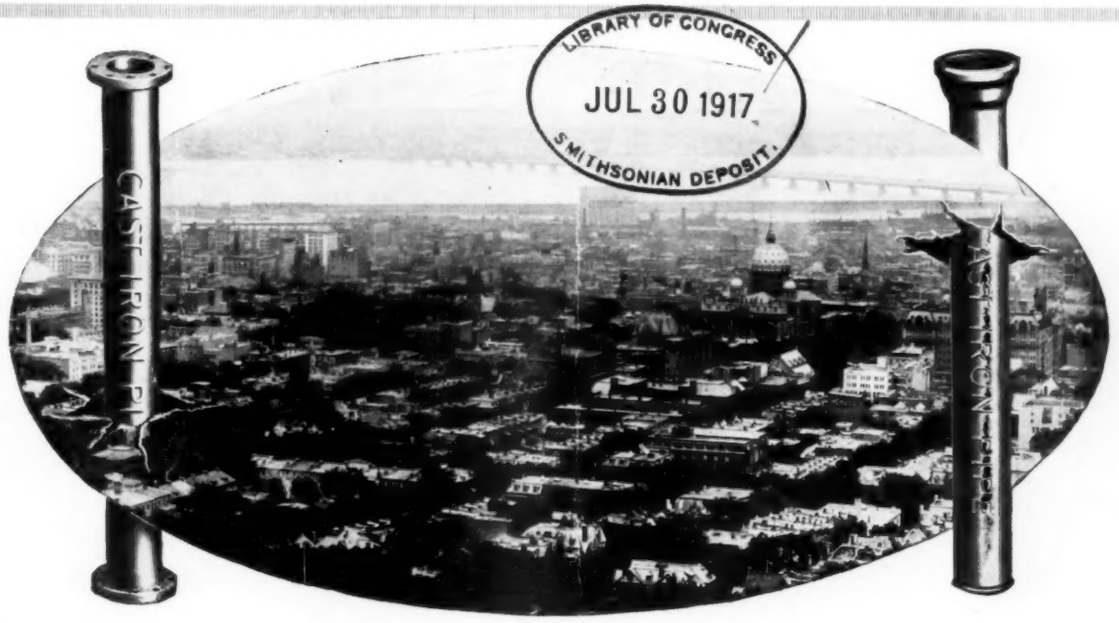

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Economically Planned Coke Handling System at Denver Expedites Removal

Consists of Interrelated System of Belts and Bins—One of Latter Adapted to Extension or Shortening at Will—Clean, Dry Product Assured—Other Advantages

By GEORGE WEHRLE
Superintendent of Gas Department, Denver Gas & Electric Light Company

The coke handling system as used in Denver prior to the installation of the following auxiliary equipment, consisted of a cable railway by which the coke was conveyed from the retort house and dumped onto the storage pile, into bins from which trucks and wagons might be loaded or directly into chutes for car loading. The capacity of the wagon storage bins was 150 tons while from 20,000 to 25,000 tons of coke can be stored in the yard each season.

Up to a certain figure, approximately the daily make of coke minus that loaded directly into railroad cars, the daily sales of coke taken away from the plant in wagons and trucks could be quite economically handled and could be loaded into the trucks at a very low cost. Offsetting this advantage, however, was the factor of intermittent demand requiring the storage of a large percentage of the coke during certain seasons of the year with a consequent heavy distribution demand at others. The daily sales during the period of heavy demand would equal as much as 300 per cent of the daily output of the plant which meant that 33⅓ per cent of the sales could be handled economically while 66 2/3 per cent was taken from storage which over the yearly period meant the enormous task of trimming, screening and loading the entire storage capacity of 20,000 to 25,000 tons that in the greater part had to be done by the use of manual labor and horse-drawn vehicles. Wagon loaders were used as much as was possible but even with their installation the disadvantage of a lack of loading space, necessitating costly delay in deliveries, was experienced.

To increase the efficiency of delivery, as well as to effect an economy in the handling of the huge amount of stored coke caused the engineers of the Denver company to work on plans whereby delay and expense of loading might be reduced to a minimum. The problem presented many difficult features due to various conditions, while the enormous cost of an ideal system had also to be considered. Plan after plan was considered from every angle and discarded during a period of something like six or seven years until finally during last year a plan was drawn up that from its simplicity, comparatively low cost and efficient outlook was approved and construction authorized.

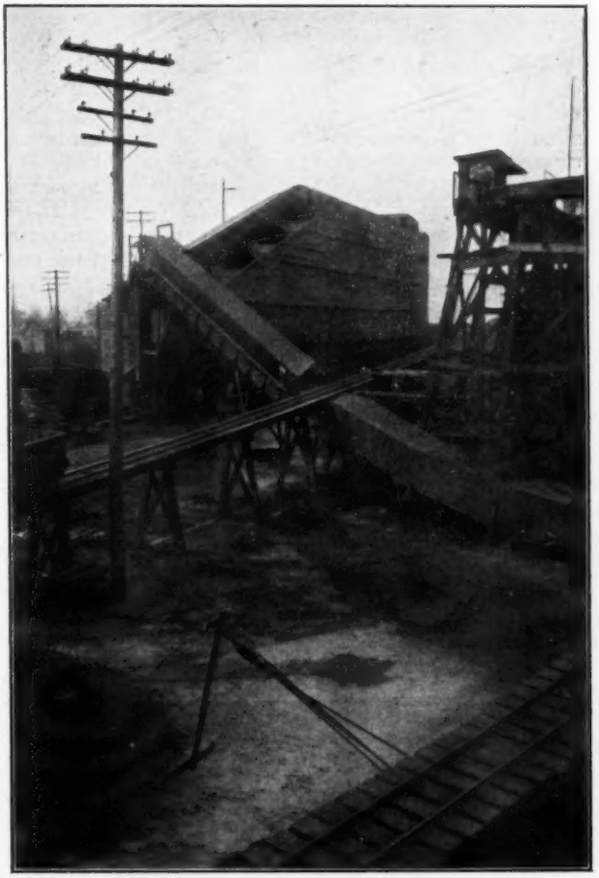

FIG. 1. BINS WITH BELT 2 IN FOREGROUND—ALSO PART OF CABLE RAILWAY SYSTEM

FIG. 2. BINS, BELTS 2 AND 3 AND SHAKING SCREEN

The plan as approved, which was carried out practically without change, called for the erection of ten wooden bins having a combined capacity of 1,200 tons of coke from which trucks, wagons and railroad cars could be loaded, the installation of three belt conveyors with all necessary equipment, and the moving of the screening plant to be incorporated with and become a part of the new system.

Storage and Loading Bins

A location for the storage bins was decided upon on ground that had previously been of no use and which did not interfere with present equipment that was desired to be of continued use. In this way the storage capacity was increased by the amount that could be contained within the bins. The location decided upon was along a railway switch used for conveying coal to the retort house and while it necessitated minor changes in this track the ground gained more than offset the cost of moving the track and erecting a concrete retaining wall on the company property line.

The bin structure is 200 ft. long 24 ft. wide and 45 ft. high at its extreme elevation. The angle of incline over a distance of 80 ft. is 20 deg. to a horizontal extending 120 ft. The distance from ground level to bottom of bins is a mean average of 9 ft.

The bins are constructed of wood on concrete foundations and are solidly tied together with iron rods. The bottoms are on an incline of 45 deg. and consist of 2 x 8-in. lumber on edge supported at the ends and center and tied at intermediate centers to the side wall with iron rods.

The side walls are built of 2-in. lumber nailed on the inside to 2 x 8 in. studding spaced 2 ft. apart which are sheathed with 1-in. lumber on the outside. Six by six inch timbers, 9 ft. apart are placed at right angles to the studding on the outside to which the tie rods are fastened. Three-quarter inch tie-rods are spaced at 5 ft. intervals both crossways and lengthways of the bins.

The first and third of the largest bins are arranged for car loading as well as wagon loading, the bottoms being in the shape of an equilateral triangle the slope of both sides being 45 degrees.

The space under the bins is used for storage of various materials such as corn cobs for the manufacture of purifying material and retort materials and is therefore not waste space, while plans have been considered of converting it into a barn if the occasion requires.

The six larger bins are to be used for lump sized coke while the smaller ones will be used for storing the various smaller sizes such as nut and blacksmith. Each bin is equipped with two loading chutes so that twenty wagons or trucks can if necessary be loaded at one time by backing up to the bins in addition to loading two railroad cars. Ten wagons or trucks can be loaded at once by paralleling the bins and as the time occupied in loading will at no time exceed ten minutes, it will be possible to actually load coke into wagons at the rate of 180 tons per hour. This allows us a loading factor of 3 to 1 over the capacity of conveying apparatus which will carry us through the first rush of teams and trucks in the mornings and compensate for irregularities of demand at any time of the day.

Conveying Equipment

The conveying equipment consists of three 24-in. belts, belt No. 1 taking the coke from the storage pile and depositing it upon No. 2. No. 2 elevates it to the foot of the storage bins where it is passed over a shaking screen, the lump coke depositing on belt No. 3 which conveys it to the desired bin while the breeze falls into a bin feeding directly into the screening equipment.

The arrangement of belt No. 1, is peculiar to the conditions of use which require that it be extended as the storage pile becomes smaller and shortened as the pile increases. To meet these conditions sections 16 ft. in length were made to which the carrying and return

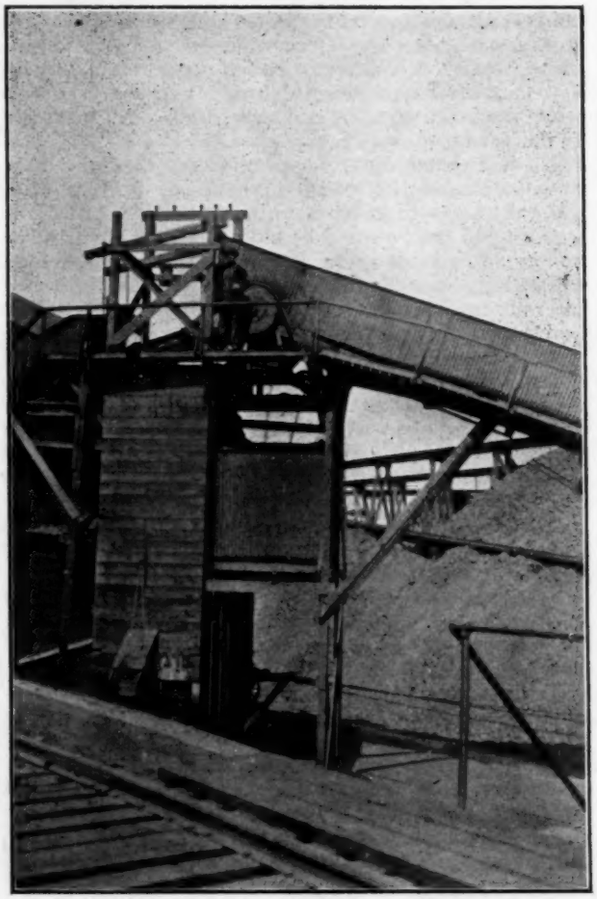

FIG. 3. CLOSER VIEW OF SHAKING SCREEN AND BREEZE BIN, WHICH FEEDS INTO SCREENING EQUIPMENT

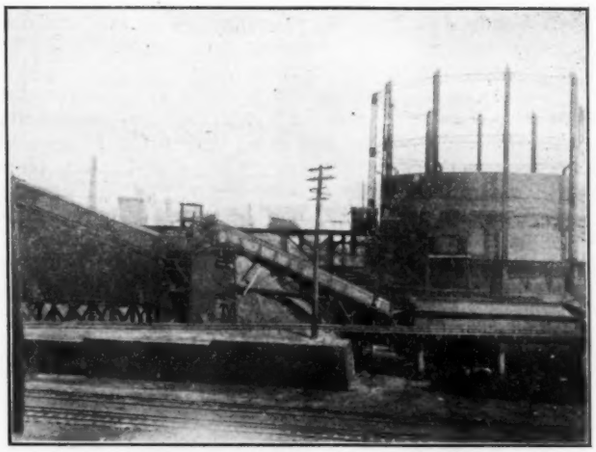

FIG. 4. ANOTHER VIEW OF CONVEYING EQUIPMENT WITH CABLE RAILWAY AND COKE STORAGE PILE IN THE BACKGROUND

pulleys were attached. The head pulley was arranged permanently while the tail pulley was fastened to one of the sectional pieces. The sections are supported on the stringers carrying the cable railway and are fastened in place by means of lag screws. The belt is likewise cut in sections and as the storage pile becomes smaller, sections of pulley frames and belt are added as required, the foot section moved ahead, frames fastened down, belt laced and operation proceeded with. Likewise as coke is added to the storage pile, sections are removed as becomes necessary. The coke will be shoveled or scraped onto this belt when the distance permits after which portable wagon loaders will be used to convey it from the pile to the belt.

Arrangement is made so that coke can be dumped directly from the cars onto belt No. 2 when desired which will in no way interfere with the operation of belt No. 1. This feature will be used to advantage at all times, belt No. 1 being used only when it is necessary to take coke from the storage pile.

Belt No. 2 is inclined to a changing angle to pass under the cable railway trestle and is on a 22 deg. angle at its greatest incline.

Belt No. 3 traverses the length of the bins and arrangement is made whereby coke can be discharged into any bin desired. The equipment used for this purpose consists of a home-made apparatus permanently attached to the belt framework over the center of each bin and is composed of a pipe roller which is raised up flattening the carrying belt and a scraper which is at the same time let down against the face of the belt scraping the coke there off.

Each belt is operated by an individual motor, the one operating belt No. 2 also actuating the shaking screen. The belts travel at a speed of 200 ft. per minute and are capable of delivering 60 tons of coke per hour to the bins.

Screening Equipment

The screen house is located at the foot of the storage bins and was not moved to its present location at the time the accompanying cuts were made. The purpose of the screening equipment is to separate the breeze into different sizes of commercial coke. Nut coke, chestnut and pea sizes are obtained, while the floating process produces from the latter two sizes, of commercially successful product for blacksmithing purposes.

All breeze produced through the handling of the coke and representing approximately 20 per cent by weight of the coke produced is passed through the screen house. That going through the shaking screen from belt No. 2 falls into a bin from which it is automatically fed into a bucket elevator. All other breeze produced about the works is hauled to a bin which is similarly fed into the elevator.

The breeze is elevated about 40 ft. to the top of the building where it passes over a stationary screen by which the nut size is separated. The nut coke passes over this screen and onto a 16-in. belt conveyor from which it is discharged into either of the three smaller bins. The breeze which passes through the nut screen passes over a double shaking screen whereby the two sizes of blacksmith coke are removed from the fine refuse which is dropped into a bin for delivery to the

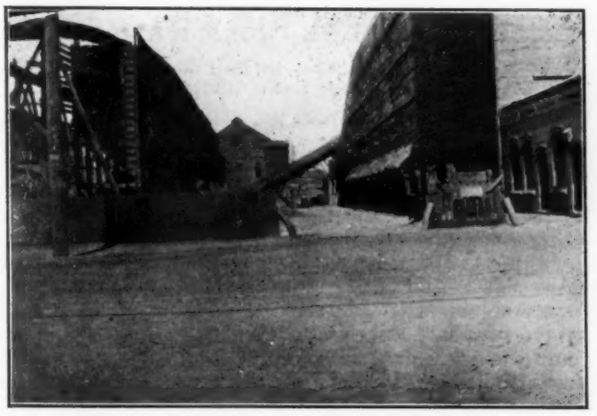

FIG. 5. WAGON AND TRUCK-LOADING CHUTES

boiler plant. The blacksmith coke is diverted into a floating tank where the lighter or desirable coke is automatically scraped from the top of the water into a bin while the heavy refuse is ejected from the floating tank by means of a screw and deposited into a bin for delivery to boiler plant. Means are provided of floating either size of blacksmith coke desired while the other size is temporarily stored. When the small blacksmith storage bins are filled, the coke can be elevated to the 16-in. nut coke belt and deposited in one of the larger bins. This has to be done at a time when breeze is not being screened but as the percentage is small a day's run can be temporarily stored in the bin in the bottom of the screen house.

Sufficient storage capacity for breeze is provided to take care of possible breakdowns in the screening plant while conveying equipment is in operation.

By the use of the described equipment the operation of handling and loading coke is reduced to the minimum, while a clean and dry product is insured the customer. The large capacity of the storage bins allows the coke to remain in them a sufficiently long period for excess moisture to be evaporated when coke is being taken directly from the retort house.

While this equipment was not in operation during the past winter, so that no comparative cost data is as yet available, its operation at the present time is proving so satisfactory that a very material reduction in handling and selling cost is assured.

In Fig. 1 is shown a view of the bins with belt No. 2 in the foreground. In this view is also shown a part of the cable railway system and coke storage pile. Belt No. 3 can be seen at the top of bins. The screen house which is not shown in the cut is located on the foundations shown at the foot of the bins. Part of the tackle used in moving this building can be seen in the extreme foreground.

Fig. 2 shows a view of the bins, belts No. 2 and No. 3 and shaking screen from another angle.

Fig. 3 shows a closer view of the shaking screen and the breeze bin which feeds into the screening equipment.

In Fig. 4 is shown another view of the conveying equipment with the cable railway and coke storage pile in the background.

Fig. 5 shows the wagon and truck loading chutes with a view of the old bins at the left of the picture.

In Fig. 6 is shown railroad car-loading chutes with scale house in the foreground.

Explains the Lea Block Rate System

J. E. McLeod Declares That in Its Final Form, It Is Very Simple and Easily Understood

It is written that "Of the making of many books there is no end," it may also be said of the making of many rates for service supplied by gas, electric, railroad and water companies there is no end, declared J. E. McLeod of the Laclede Gas Light Company of St. Louis, in his paper on "The Group Block Rate," presented before the recent convention of the Missouri Association of Public Utilities. The rate question, like the poor, taxation and some other things, we have always with us, and to prepare schedules of equitable and uniform rates for public utility service is one of the most difficult matters with which the operators of such utilities have to contend.

Some years ago in a paper read before the National Electric Light Association, Henry L. Doherty said "Of the many trying problems that are apt to confront a central station manager, I am free to confess that I felt less ability to deal with the rate question than any other that might have come up." The Oklahoma Corporation Commission in a recent report said that "The matter of rate making is a complex subject and one neither well developed nor generally understood."

Difficulty of Making Equitable Rates Not Understood by Public

The impracticability of making uniform and absolutely equitable rates to all customers is well understood by those who are engaged in the operation of public utilities, but unfortunately, it is not fully appreciated by the general public. The reason why absolutely equitable and uniform rates cannot be established by utility companies is that very few customers are served under precisely similar conditions.

A street railway will carry a passenger one block, or possibly fifteen miles for the regular fare of five cents. Local telephone rates are uniform, regardless of the length of the line used. Gas is delivered at the city's limits through long lines of costly mains at the same rate that is charged a customer within a block of the manufacturing plant. Electric current is furnished to customers of the same class at the schedule rate, without any distinction as to the distance from the central station. The regular postal rate is two cents for which a letter will be carried thousands of miles, or only a few hundred yards as the case may be. It is, therefore, evident that perfectly consistent rates for utility service cannot be made on any practical basis.

To charge a passenger on a street car for the distance carried; the user of a telephone in accordance with the length of line and exact time it was in service, and gas and electricity users on basis of distance from manufacturing plants is manifestly impossible. Inequality in rates or prices may be noted in charge made by merchants for commodities handled, as for instance, in the case of two customers buying the same article from a merchant; one takes his purchase with him, while the other requires that his be sent to his home, a

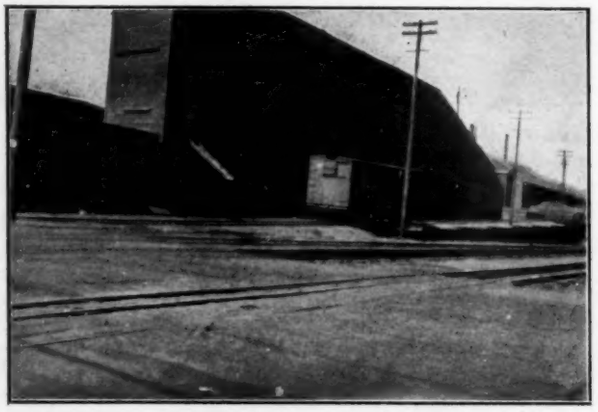

FIG. 6. RAILROAD CAR-LOADING CHUTES

distance of possibly six miles. In all fairness the one who demands delivery at his home should pay more than the other, but it has been found impracticable to make two prices on the same article to meet the different conditions of sale.

Dual Nature of Public Utility Corporations

Public utility corporations possessing as they do a somewhat dual nature, being in part a private corporation and in part a public enterprise, have in recent years been subject to federal regulation when engaged in interstate commerce, and state regulation when conducting interstate business. The former being under the jurisdiction of the Interstate Commerce Commission, and the latter under the State Public Service Commissions, or bodies having similar powers. The principal work of such commissions has been the consideration and adjustment of rates. In addition to the efforts of the commissions many associations, committees, managers, economists, legislators, statisticians, engineers and others have given a great deal of time and study to the subject. Innumerable schedules have been devised, but no general method of basing rates has been adopted by the utility companies.

Early Rate-Making Methods in Gas Industry

In the infancy of the gas industry the making of a rate schedule was a comparatively simple matter. The universal practice being to charge all the traffic would bear. This method was followed for many years by the railroad companies, and was not considered unfair or unreasonable, as the customer was required to pay only what the service was worth to him. If he thought that the charge was more than the service was worth, he had the privilege of using the same transportation facilities that he had employed before the railroad was built.

If the prospective gas customer thought that the rate charge was too high he continued to use candles or coal oil for lighting purposes. This method is sometimes called the straight line rate.

From time to time, as improvements were made in the methods of manufacture and gas burning appliances; economies in operation and perhaps the pricks of conscience, rates for gas were arbitrarily reduced without any attempt being made to arrive at any logical basis for the reduction of so many cents a thousand cubic feet. A special rate was sometimes given to users of exceptionally large quantities and was called the wholesale rate.

Rates Founded on Scientific Principles a Comparatively Recent Innovation

Within a comparatively recent period the question of preparing schedules of gas rates founded upon scientific principles has been given particular attention.

A rate of this kind requires as a first consideration that each customer pay as nearly as possible his just and proper proportion of the expense occasioned by his individual demand upon the company's facilities.

The price should be low enough to encourage and extend the use of gas in new directions and at the same time give a fair return on the investment.

It is rather difficult for one who has not given much attention to the subject to understand why two customers each using 1,000 cu. ft. of gas a day should not be entitled to the same rate. The reason is very readily seen when the conditions are known.

One of the customers may use his 1,000 cu. ft. all in one hour and therefore require an investment by the company in facilities that will meet his demand. The other uses 100 cu. ft. an hour for ten hours a day and a much smaller investment will supply his needs. It is therefore plain that the long hour user is entitled to a lower rate because it costs less to serve him than it does the short hour customer.

The Group Block System

A scientific rate based upon the fundamental principle that every customer should be required to pay his proper proportion of the cost of serving him has been developed by Henry I. Lea of Chicago, and has recently been adopted by some gas companies. The plan is known as the Lea Group Block System and eliminates many of the inequalities that have existed in former schedules.

One of the first steps in building a rate schedule under the Group Block System is to determine the cost of serving each customer, or rather, group of customers and this is done by making a complete analysis of the operating expenses, allocating the various items of expense under the headings of Capacity or Demand Expense, Customer's Expense and Output or Production Expense, as it has been found that the total expenses of operation can be distributed either directly or indirectly to these classes. There will probably be some difference of opinion as to the classification of certain expenses, but the methods followed in the Milwaukee case or used by A. S. B. Little, Gas Engineer of the State Public Service Commission of Illinois in the Quincy case can be safely followed.

Demand Expense

Capacity or Demand Expense includes such items as cost of repairs to building, equipment and apparatus; holder station expense; main service and meter maintenance; general expense, etc., such expenses being incurred to meet the demands of the customers upon the company's facilities.

Certain other expenses are caused by the customers supplied from the main, and they include such items as reading meters, keeping the account, making out bills, setting, removing and turning on and off of meters, the cost of collection, etc., and apply equally to all customers.

The Capacity Expense plus the Customer's Expense constitute the Fixed Charge to be paid by each customer in addition to the charge for the gas consumed.

The Output expense or Production Cost includes all labor, material and supplies used in manufacture of gas.

Then there is to be added a certain percentage to provide a reasonable return on the investment.

How much this percentage should be is a much debated question, and there appears to be a wide difference of opinion on the subject.

The rates suggested seem to vary from 4 to 10 per cent, according to the interests or prejudices of those concerned.

The new war revenue tax now before Congress provides that a tax is to be levied upon all profits over and above 8 per cent. If this provision of the law be adopted, then it would seem that 8 per cent is a fair and proper rate, and stockholders should receive that return upon their investment.

It might be asked why a limit should be placed on the rate of return on investments in public utilities.

A limitation of the rate of return on the investment is likely to result in holding back development of the business, for after the stipulated rate has been earned there would be no particular incentive to undertake new experiments or improve the current methods with a view to lessen the price of the product, if no benefit is to accrue to the owners for probable risk involved in such new undertakings.

It has been argued that if a utility expends money in an experiment which does not prove to be a success, the loss incurred should fall upon the stockholders, but if it resulted in lessening the cost of the product then the price to the customer should be reduced, or in other words, that all of the benefits should accrue to the customer.

If this idea is accepted as a principle of regulation it is difficult to imagine what inducement there would be to improve existing conditions under which the regulation rate was being earned.

If a skilfully managed utility can earn in excess of the specified rate while selling its product at a price corresponding to that charged by other companies similarly located, what objection could be made if such excess were, in the language of the day, split three ways, that is, between the customers, the employees and the owners.

Proportion Chargeable to Each Customer

The total capacity or demand expense having been found in the manner above stated, it is necessary to arrive at the proportion properly chargeable to each customer, or rather each group of customers. For this purpose a complete analysis must be made of the customer's accounts, which would show capacity and the average consumption through each size and type of meter, and from this the load factor of each group may be determined.

The average capacity expense per unit of consumption in each group can then be found, and to this the customer's charge is added, giving the fixed charge applicable to each group.

An initial rate per thousand feet is decided upon and the volume of gas required to be used at such initial rate must be sufficient to cover the fixed charge and cost of manufacture. This quality is defined as the initial volume, but, of course, every customer in a group will not use such required volume, and therefore, secondary quantity is made at a lower rate and for such a volume as will make up the deficit. This secondary quantity is known as the secondary volume, and is generally a fixed quantity applying alike to all customers.

After the initial and secondary volumes have been consumed the excess is charged for at practically the cost of production plus profit, as all expenses have been provided for in the rates charged for the initial and secondary volumes, and by making a very low rate for all gas consumed in excess of the initial and secondary volumes the use of gas is extended to new fields and the sales per meter increased, thereby improving the load factor of the company's operations.

Demand Measured by Capacity of Consumer's Meter

As the demand upon the capacity of the company increases so does the initial volume increase, and the consumer with the greatest hourly demand will pay for a corresponding volume at the initial rate. The demand of each customer is measured by the capacity per hour of the meter installed and the load factor. It is assumed that meter of only sufficient capacity to take care of the customer's load and use of same will be installed, and in event that the load is increased a larger meter will be required to meet the demand and the initial volume at the initial rate will be increased accordingly.

If, on the other hand, the load is reduced a meter of smaller capacity can be used and the initial volume reduced.

This method of determining the rate based upon the load factor and the meter capacity has in many instances resulted in the customer changing his method of using the connected load to longer periods so as to secure the benefit of a smaller initial volume and a correspondingly lower average rate. This has had the very desirable effect of converting short hour users into long hour ones, thereby straightening the consumption curve.

Standardization of Meters

Under the Group Block form of schedule a separate initial volume should be made for each type of meter of different capacity, but until such time as meters are standardized it is necessary in order to avoid the multiplicity or different volumes, to group them under as few sizes as possible. There are now some eighteen but there is no good reason why the sizes cannot be reduced to four, which could be made to answer all practical purposes.

The preparation of a schedule under the Lea System involves the tabulation of a great many figures and innumerable calculations, but in its final form, as presented to the customer, it is very simple and easily understood. It also possesses the merit of a uniform price to all customers without distinction as to the purpose for which the gas is to be used and prevents any question of discrimination being brought up by charging a different price for the same product when used for different purposes.

Proportional Minimum Bill

The Group Block plan provides for a proportional minimum bill, that is, a minimum bill based upon the size of the meter installed; the larger the meter the greater the minimum charge.

This feature, however, is not included in some of the schedules which have been under the Group Block System. The lack of a minimum bill provision in any schedule results in discrimination, for without such a provision in the rate many meters are installed and held for emergency use in case of failure or other forms of supplying light, heat and power.

Such installations cause a capacity expense which must be borne by the other customers who make active use of the company's facilities and they are therefore compelled to bear the burden of the expense caused by the investment in inactive facilities.

The Group Block Rate was adopted by the Laclede Gas Light Company in July last, the schedule being as follows:

Charge for Gas Used Through One Meter in One Month

Initial volume	at	$0.75 net per M. cu. ft.
Secondary volume	at	.55 net per M. cu. ft.
All additional	at	.45 net per M. cu. ft.

Capacity Required Per Hour (cu. ft.)	Size Meter Used	Initial Volume (cu. ft.)	Secondary Volume (cu. ft.)
0— 200	5 Lt. Ord. 10 Lt. Ord. 5 Lt. "B"	7,800	6,800
200— 800	20 Lt. Ord. 30 Lt. Ord. 10 Lt. "B" 45 Lt. Ord. 60 Lt. Ord. 30 Lt. "B" 80 Lt. Ord. 100 Lt. Ord.	11,100	6,800
800—2,000	150 Lt. Ord. 60 Lt. "B" 200 Lt. Ord. 250 Lt. Ord. 100 Lt. "B"	20,300	6,800
2,000—3,000	150 Lt. "A"	37,400	6,800

Over 3,000 add 1,000 cu. ft. to the Initial Volume of 37,400 for each additional 100 cu. ft. of hourly capacity required.

It is to be understood that a schedule prepared under the Lea Block Rate System for one locality cannot be safely put into effect in another city as the conditions would be altogether different and the same Initial and Secondary Volumes and rates would be entirely out of line.

The adaptability, with probably certain modifications, of the Group Block Rate to the electric business has not yet been demonstrated, but if it can be used it would have the effect of greatly simplifying electric schedules which is a "consummation devoutly to be wished."

Can New Business Be Maintained in Wartime?

English Experience Furnishes an Answer Emphatically in the Affirmative—Gas on the Road Motor—Meeting of Institution of Gas Engineers

By NORTON H. HUMPHRYS

The possibility of maintaining something like normal business demands and obligations is naturally attracting attention in American gas circles under present circumstances, and the experience in England is decidedly in the affirmative. I do not say that the full degree of American activity and push in the selling department can be kept up, as difficulties may and probably will arise, both in connection with labor, and with the supply of materials.

In some cases the outdoor department, here, is practically closed, the maintenance of burners has to be discontinued, and it is difficult to cope with current complaints and meter changes. There has been a large reduction in all kinds of shop and store lighting, the practical abolition of all outdoor illumination, public or private, sweeping restrictions on the business hours of saloons and restaurants, and the sale of intoxicant liquors, and the summer daylight saving legislation.

Where there are no compensating influences in the way of camps, hospitals, munition works, or military activity, which are almost exceptional, as the country is becoming not greatly removed from one vast barracks, reductions in output of 15 to 25 per cent are reported. But these are few and far between, and in a general sense, sales of gas are well maintained.

Analysis of Accounts Shows Uniform Increase In New Customers

A few facts from "Field's Analysis of the Accounts of Gas Undertakings for 1916," may be quoted. At the close of that year, the three metropolitan gas companies supplied about 1⅓ millions of customers with 43¼ million thousands cubic feet of gas, as against nearly 44, in 1913. The eight suburban companies had 442,000 private service connections, including over 50,000 laid on during the last three years, and in the same period, the sales of gas advanced from 12½ to 14 million cubic feet. Eleven of the largest municipal gas undertakings in the provinces numbered nearly a million consumers, including 50,776 taken on since 1913, and supplied them with 29 million cubic feet as against 27¾ in the former year. Nine leading provincial companies added 28,842, bringing the total number of customers to over half a million, and the consumption was 18½, as compared with 17 million cubic feet in 1913.

As might reasonably be expected, the lighting restrictions affected London to a larger extent than the provinces. They reduced the average per ordinary consumer to 65,587 cu. ft. or about 5 per cent, though the slot meters maintained an even 16,500. But the other classes experienced an increased average both on the ordinary and the slot consumption, especially in the important industrial areas. They show an average of over 50,000 cu. ft. per ordinary, and 15,500 per slot meter.

Increased Activity in Industrial Sales

As increased activity of all kinds has gravitated towards the large factory and more densely populated districts, sometimes at the expense of smaller and less favorably situated towns, the figures above quoted must not be taken as a fair reflection of the whole, large and small. But it is evident that the advantages special to gas have received a very powerful advertisement, the benefit of which, it is only fair to state, has been accentuated by falling upon ground previously well prepared, by the labors of the British Commercial Gas Association, to receive such impressions. I emphasize this, because the work of the pioneer is frequently forgotten, when the seed he has sown has fructuated to vigorous life.

The enormous extension of female employment has actively tended to labor saving without overstrict regard to cost, in the domestic household, which has been assisted by the disproportionately high prices of solid fuels. Within the last three years, coal has gone up over 100 per cent in price, while the average advance on gas has been within 25 per cent and the munition or outdoor worker is in a mood to appreciate the advantage of being able to obtain a hot meal within ten minutes at any time of the day or night, and that in a warm room, (which can be secured by the simple expedient of sending a requisition to the nearest gas office for a slot meter, gas fire, and cooker), as compared with the labor, delay, and discomfort incidental to the kindling of a coal fire. The prevalent high and in some cases exorbitant rates of day wages, enables the slot user to spend more on articles of food, and to increase the frequency of hot meals. As I anticipated, the effect of daylight saving regulations is negligible under present conditions, but would probably be more evident if normal public and outdoor lighting could be maintained.

Coke As a Fuel for Boilers

In a communication to the *Electrician*, E. W. L. Nicol, fuel expert to the London Coke Committee,—a body that is rapidly advancing to a similar position as regards gas coke, to that attained by the Sulphate of Ammonia Committee in connection with another residual,—considers the mechanical stoking of large steam boilers with gas coke or breeze exclusively, and the lines on which, in the light of modern experience, research may be directed, with a view to the improvement and the standardization of steam generating appliances and to the elucidation of factors advantageous to the efficient combustion and utilization of non-volatile coke, including all grades of smalls or screenings.

The use of such fuels, and the necessary structural alterations incidental thereto, affords interesting and immediately practical new engineering problems. He emphasizes the importance of avoiding loss of heat by quenching coke, which could be accomplished by conveying the spent charge direct from the retort into a boiler furnaces, where practicable, and gives an illustration of an arrangement for heating a water boiler, either by hot or cold coke.

Hand fired furnaces are more or less easily adapted for coke, and the proper control of the draught both under and over the fire, is desirable though not essential.

For internally fired boilers, and to a less extent for

externally fired, various forms of forced draught sprinkler mechanical stokers had been used with satisfactory results, also well known makes of chain grate or traveling grate furnaces. No doubt the very satisfactory results obtained, in one case over a period of six years in respect to the wear and tear both of furnace linings and machinery, were due to the preliminary removal of all volatile sulphur from the coke at the gas works. Coke may be regarded to some extent, as purified coal.

Reduction in Excess Air

The London Coke Committee has adopted three standard sizes for smalls, viz.: 2 to ¾, ¾ to ⅜, and all smaller than ⅜ inch, but do not appear to have decided upon any distinctive titles. Mr. Nicol claims that the usual arrangements for consuming bituminous coal as fuel require 150 to 300 per cent excess of air to ensure complete combustion, but that non-volatile fuel can be properly consumed with a much smaller excess, as it requires no secondary supply. A number of practical tests with bituminous coal, coke and breeze, showed respective plant efficiency, 69, 79 and 73 per cent, pounds of water evaporated from 212 deg. per lb. of fuel, 7.5, 9.8, and 7.0; cost per 1000 gal. evaporated, 16/8, 12/10, and 7/0.

In view of these facts, the use of raw coal under boilers is to be deprecated as uneconomical from the user's point of view; as waste of an important national asset; and is involving loss of the liquid residuals that would have been recovered and utilized at the gas works; and as a possible cause of atmospheric pollution from soot and smoke.

Gas as Motor Fuel

A writer to the correspondence columns of the *Gas Journal* expresses a high opinion as to the future use of gas as fuel on road motors, as likely to be permanently adopted for mechanical traction, and not simply as a war time expedient. For various reasons, the present high price of petrol is not likely to be affected for many years to come, as the difference in cost of gas and of petrol is likely to remain as at present.

The supply of petrol is foreign and limited, while town gas is not only a home but a local product, of which ample quantities are available in all parts of the country.

The future motor outfit will include arrangements for taking gas supply from any suitable connection, and the engines at present in use require absolutely no alteration to enable them to be run on gas.

Without doubt, petrol is the more convenient factor for concentrated energy, but the disadvantages connected with storage, handling, uncertain supply, and high prices, are all in favor of gas, which is at present hampered by the fact that but little attention has been given to the best methods of usage.

The chief difficulty is the bulky containing vessel required, if it is used at ordinary pressures, but improvements are sure to come in the direction of compressing, solidifying, or liquifying gas, to enable it to be packed within smaller compass.

Meeting of Institution of Gas Engineers

The usual June meeting of the Institution of Gas Engineers attracted a good attendance, even for normal times, and the British experience is that the postponement or even the curtailment of customary technical gatherings is a mistake. In these strenuous times, gas engineers find themselves more than ever in need of the stimulus afforded by mutual association and personal contact. The proceedings in the meeting hall were thin, being confined to the President's address, the reports of Special Committees, and the regular routine and domestic business, polished off by speeches from the prospective President, Lord Moulton, head of the Ministry of Munitions High Explosive Department, and Guy Calthorp, National Controller of Coal Mines, which formed appropriate indications of the importance of our industry from a National point of view. Without disparagement of these proceedngs, the leading attraction was the visit to the president, A. E. Broadberry, on his own ground at Tottenham, (an important London suburb) where a large modern gas plant, and also an electricity generating set driven by gas engines, was on view. Tottenham possesses one of the few "combined" undertakings in this country. A free hospitable reception made every visitor feel at home.

The principal feature was a new retort house equipped with two benches, each containing seven settings of fours. The retorts are of a very narrow slot shape, 5 ft. 3 in. x 7 in. at the top, each intended to carbonize 6½ tons of coal per diem. This gives a maximum capacity of 364 tons of coal, and a make of about 4½ millions cubic feet of gas.

The retorts are heated by gaseous fuel, obtained from coke breeze, consumed in external producers with rotating grates, and automatic ash discharge, of which there are four, each capable of gasifying 20 tons of breeze per diem.

Special arrangements of overhead coke storage hoppers, with full equipments for handling coke and breeze, are included in the structure. Extensive use has been made of clinker concrete as a building material on the works. It is moulded and roughed to resemble high class building stone, and is assisted in this respect by its warm French grey colour.

Another detail that came in for much attention was a block of four purifiers on the overhead system, having sides, bottoms, and interior columns of reinforced concrete. The dimensions of each box were 56 ft. x 42½ ft. x 6 ft. deep.

The benzol extraction and rectification plant, the extent to which female labor has been utilized, and the general excellent condition of the engines and machinery, notwithstanding adverse circumstances, were amongst other noticeable items.

Long-Expected Swing Toward By-Product Oven in This Country Now Under Way

In the United States it would appear that the long expected swing toward the by-product coke oven was at last taking place. The production for 1916 is estimated at 325,000 tons, an increase of 75,000 tons over the figures for the year 1915, or 30 per cent. Of this production, 272,000 tons are credited to the coke ovens and 53,000 tons to the gas works and bone carbonizing plants. The corresponding figures for 1915 were 197,128 tons for the coke-oven plants and 51,921 tons for the gas works, a total of 249,049 net tons, this data having been recently given out by the U. S. Geological Survey. To this amount should be added 1,000 tons estimated for the recovery of sulphate of ammonia from bone carbonization, etc., so that the total figure for the year 1915 would be 250,049 net tons, reckoning all forms as sulphate.—*Bulletin of the Barrett Company on Sulphate of Ammonia Production.*

True Efficiency in Engineering Requires a Thorough Knowledge of the Human Factor

John P. Frey Declares That Those Who Direct Industry Must be Possessed of Broader Knowledge Than in the Past

It is self-evident that if we are to have true efficiency in industry there must first be a thorough understanding of the human factor in industry, declared John P. Frey in a paper presented before the Congress of Human Engineering, held at the Ohio State University. Those who direct industry must be possessed of broader knowledge than in the past, because the character of our industries has been revolutionized within the last few decades, and in many respects the workman does not occupy the same position in industry which he did a few years ago.

Obsolete Standards of Employment

It is frequently the case that in employing labor, the first thought is given to the worker's age and his apparent muscular strength.

We may well ask ourselves whether there is efficiency in such methods.

Perhaps we may secure an important side-light upon the problem we are considering by reversing the situation. Inasmuch as the employer is deeply concerned as to whether the human beings he is to have under his direction are capable of performing efficient labor and must, if he employs them, have their standard of living determined largely by his policies, does there arise a question as to whether the employer is possessed of that understanding of human necessities and that spirit of justice which warrants the community in permitting him to have under his direction and surrounded by the influences and conditions which he creates in his establishment, a large number of those who constitute the community in the vicinity of his establishment?

Can he be safely trusted with the oversight of the human beings in his employ?

Qualifications of Engineers

Are the engineers composing his directing staff qualified to be given the right of directing the employees so that their labor will be advantageous to the employer, to the community, and what is equally as important, to the workmen themselves and their families?

We may well ask ourselves this question: "Is the employer's influence on the workman, and that of the engineer, beneficial to the individual, to the industry and to the community, or should the direction of labor be considered wholly from the standpoint of the worker's value as a unit in the production of dividends?"

There is one great problem connected with industry of which we know but little, and upon which it is most essential that we should have definite information, if the engineer is to have that knowledge without which he is poorly qualified to undertake his responsibilities.

The engineer when dealing with structural steel knows as the result of innumerable tests that the breaking strain of the metal is about 65,000 lb. per sq. in., but that while this is the breaking strain the elastic limit is about 35,000 lb. per sq. in. When the steel has a strain of 35,000 lb. placed upon it, the elastic limit is passed and the metal receives a permanent change of form; it is no longer able to return to its original form when the strain is removed for a structural change has taken place.

In addition to this, the engineer is aware that if a strain approximately as great as the elastic limit is repeated many times in rapid succession, the steel will finally break even though the breaking strain of a straight pull of 65,000 lb. has never been placed upon it. We are informed that the engineer divides the breaking strain by four in order to determine the factor of safety in the structure which is being erected, so that not more than one-half of the load which would be required to reach the elastic limit is allowed to rest upon it.

Elastic Limit of Labor

While we can determine the elastic limit and the breaking strain of steel, we have no knowledge which will enable us to determine either the elastic limit or the breaking strain of labor upon the human being. We have not yet discovered the average workman's normal labor efficiency for productive labor, neither do we know what should be the average number of years during which the normal workman is able to produce efficiently.

I was talking with a manager of a large industrial plant some time ago who believed in human efficiency, and he was doubtful of the value of scientific management because it had so far failed to submit any truly scientific data which would show records of long-time human efficiency, or the workman's capacity for normal production over long periods of time. He believed that the industrial engineer of to-day had devoted altogether too much time to the purely mechanical problems of production as compared with the time given to the study of human beings as producers and as members of the community.

We are justified in looking to the engineers for efficiency. Industrial engineering demands efficiency, but we are of many minds when it comes to determining what efficiency may be.

Perhaps efficiency in industry is the ability to do things as well as it is possible to do them by having accurate scientific knowledge of all the problems and the factors involved, and by keeping in mind the fact that the worker is a human being, a member of the community, and a citizen who must take his part and his responsibilities in determining our standards of civilization. Or is efficiency the ability to produce so much physical exertion during a short period of time? Is it the ability to successfully feed material to some semi-automatic machine at a high rate of speed?

Is there a distinction which must be maintained in the efficiency of the workmen of to-day as compared with the craftsman of the medieval period when self-expression was encouraged and the worker exercised his creative faculties?

Experiments on Human Beings

It is without doubt a step in the direction of true efficiency when the engineer experiments with a new type of machine for the purpose of discovering its maximum capacity for production. It may be advisable to speed the machine up to its limit, to operate it at its maximum capacity until it is worn out and then throw it into the scrap heap so that it may be replaced by another. These experiments with machines and with material are essential to efficiency. But how far should the engineer be permitted to experiment with the human being who works with the machine? How far should he go, or should he be allowed to go in his effort to discover the workman's physical and nervous elastic limit or their breaking point?

Is it efficiency to endeavor to discover through applied tests, what the normal worker's greatest output from the age of twenty-one to forty years may be? Is it efficiency to discover whether the elastic limit, the point where the worker is no longer able to maintain his normal capacity for exertion, is reached at forty, forty-five or fifty years? Is it efficiency to test the worker's capacity for production in the same manner that the machine or material is tested? Is it true efficiency to do these things from the standpoint of mere production and without regard to the welfare of the community, the worker's long-time capacity and his individual welfare?

Determining Greatest Production of Workman in Lifetime

I would suggest that it is not the duty of the engineer to find out how great an output a man can produce in the shortest period of time, but rather to have in mind the greatest production which the worker can accomplish in a life-time.

Unfortunately we are lacking in scientific data to guide us effectively in approaching this problem. It is recognized that fatigue has a direct bearing upon the worker's physical and mental efficiency, but we have no data relative to fatigue covering long periods of time. The only studies of fatigue in our possession are short-time studies which have been made largely in laboratories. No long-time studies in either fatigue or efficiency have been made and there is no scientific knowledge which would enable the engineer to know what the elastic limit of fatigue is.

There are other tremendously important problems which the engineer must work out, if confidence is to be placed in him and safe and satisfactory results follow his directing authority in industry.

What changes must be made so that the young worker will receive an adequate manual and technical training?

What systems and rules must be adopted in industry so that the younger men will be trained to take the place of the skilled mechanic as time passes?

What is to be done so that the monotony connected with much of our production of to-day will be so understood that the necessary conditions will be established which will prevent the deadening influence of this character of work upon the workmen?

What shall be done in view of the intense specialization of labor in industry which deprives the workers of the opportunity of industrial training?

Dearth of Skilled Craftsmen

There is one group on the engineering world who believe that the old time skilled mechanic is no longer essential, that in his place has come the specialized industrial engineer, who, because of the knowledge which he possesses, is competent to direct and instruct less skilled labor to perform all of the work upon which the highly trained mechanic was formerly employed.

It has been recognized for some time that there is a dearth of skilled craftsmen in the United States, and while one group of engineers have claimed that they are no longer essential to industry, as the trained engineer has made it possible to dispense with them, there has been a large group of engineers, who, after having given the problem their attention, have decided that apprenticeship in some form must be re-introduced into industry.

Regulation of Industry

There are some elements to the general problem which can be readily understood. The employer has invested his capital in business, he has the problem of keeping the sheriff's flag from the door, as well as that of making progress, building up his business, and meeting the competition of the open market. The question of protecting his investment and making it profitable may become his predominant thought, but the worker's welfare as well as that of the community, make it necessary that the employer's right to operate his business to suit himself and the right of the engineer to direct labor along the channels which seem to be most profitable to the employer cannot be considered as of greater importance than the necessity of protecting the workman's mental and physical standards.

The engineer's problem, if he is to be of true value to the employer, the community, and himself, is to so oversee production that the methods of operation will in no way be injurious to the worker physically or mentally or tend in any manner to lower his standard of living.

Any conditions which prematurely exhausts the worker, or which fails to enable him to live as an American, cannot help but lower the standard of efficiency.

True Efficiency the Conservation of Worker's Strength

It would seem that one of the most important duties of the engineer is to convince the employer, as the result of the scientific knowledge which he has gathered, that true efficiency is the conservation of the worker's physical strength and mental capacity so that the worker can be of greatest benefit to himself, his family, and to industry during a normal life-time.

Briefly then, the problem created by the human side of the worker makes it essential that the engineer should have a scientific knowledge of the physical side of the problem, that he should have a scientific knowledge of fatigue, of the worker's nervous and physical elastic limit, that he should understand that monotony or high speed of production tends to deaden the worker's creative faculties, that to have all of the directing authority, means a large army of labor who must depend upon others for all of the necessary information required to perform their labor.

The engineer of the future, if conditions in our industries are to be properly shaped and developed, must in addition to his engineering knowledge, that is, knowledge of machinery, materials, and mathematics, possess an understanding of psychology and a well-grounded knowledge of economics.

And yet with all of these, there is still one more vital fact which the engineer must understand and that is that in this country the principle of democracy must be recognized and applied in industry.

Need of Democracy in Relation to Labor

In addition to all of the scientific knowledge which the engineer must acquire before he is capable of undertaking the direction of labor he must learn to meet with the workers and discuss the problems which affect them as workers. He must freely recognize their most necessary right to have a voice in the determination of the conditions which affect them in industry.

All of the knowledge which the engineer may acquire, will fail to secure successful results if he feels that his position is to be that of the arbitrary director and overseer of those who toil in our industries.

The Use of Gas for Vulcanizing Automobile Tires

Leo J. Sullivan Sets Down the Application of the Correct Pressure and Heat as the Fundamental Basis of Any Type of Tire Vulcanizing

The use of rubber tires on vehicles has become almost universal from the baby's carriage to enormous trucks, and a vast industry has been built up to supply this demand, declares Leo J. Sullivan in the July *Gas and Electric News*, published by the Rochester Railway & Light Company. No tire is made entirely of rubber, but must be strengthened by the addition of mineral substances, and on the successful use of these compounds depends much of the success of the tire. The tire is made on a "core" or design, and is built by filling a high grade of fabric (sea island cotton in the best tires) with rubber. This fabric must be completely and evenly filled in every pore and particle; thoroughly saturated so that not a bubble or weak spot is left anywhere in the material.

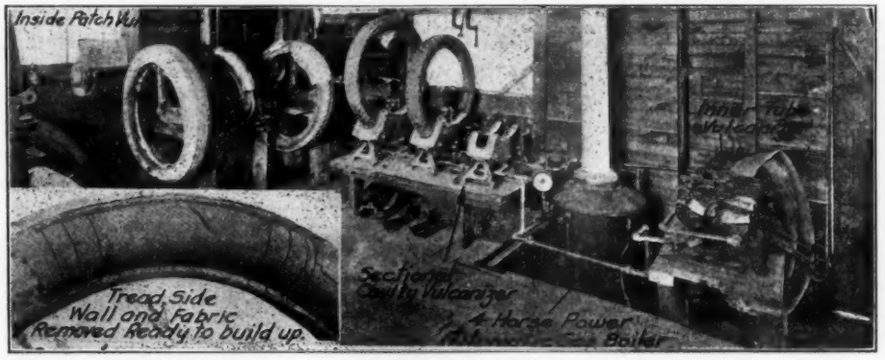

FIG. 1. TYPE OF MOLD INTO WHICH REPAIRED TIRE IS PLACED

Repair Necessary Even to Best Tires

Modern tires are subject to constant wear and sometimes abuse. This has made necessary the proper development of the tire repair business to put the tires back in shape and to increase their life. The repairing of tires has developed during the past few years from makeshift temporary work to a scientific and dependable operation, requiring not only skill, but familiarity with the handling of rubber, its peculiarities, the relations of fabric to rubber, the means of uniting these materials by liquid rubber or cement, and the proper vulcanization of the whole.

Vulcanization is the process by which the outside tire casing and inside tubes are repaired after having been cut, punctured or blown out. The rubber and fabric is cut away from around the affected part and this is replaced by specially prepared repair fabric and gum. The insert in Fig. 1 shows the method of removing fabric from around a blow out. The space is then built up with exactly the same kind and thickness of material which must be made to adhere to the old material so that it becomes an integral part of the tire.

The fundamental basis of any type of tire vulcanizing is the application of the correct pressure and heat. Fig. 1 shows a type of mold into which the repaired tire is placed and Fig. 2 shows a cross section of the same apparatus. Steam is admitted to the steam cavity to supply the heat, and a properly shaped air bag is inserted in the tire and filled with air from 45 to 60 lb. per square inch. When this air becomes heated it expands and exerts an additional pressure on the repair part. The combination of the pressure and heat for a definite time causes the repair gum and fabric to be "cured" and then becomes a part of the tire itself. There are several kinds of molds used for vulcanizing various parts of a tire but they all embody the principle of applying heat and pressure.

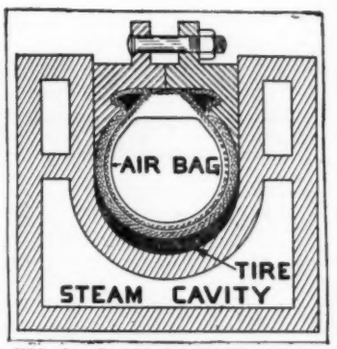

FIG. 2. CROSS SECTION OF SECTIONAL CAVITY VULCANIZER SHOWN IN FIG. 1

If too much heat is applied the tire will be "over cured" and the material "burned." This shortens the life of the tire by causing the affected parts to crack. If too little heat is applied it will be "under cured" and the new and old parts will not adhere and withstand wear. To overcome this difficulty a constant steam pressure is very essential. With a gas-fired boiler, the steam pressure can be held constant by an automatic pressure controller. These regulators are indispensable and insure better vulcanizing because they maintain an even temperature and save gas by burning only as much as is actually needed to keep up steam. The device regulates the amount of gas admitted to the burners according to the required steam pressure. Set the regulator at say 60 lb. and when the burners are turned on they will receive a full flow of gas which will automatically cut down when the steam is raised to the desired pressure.

One of the recent installations in Rochester, that of the Union Vulcanizing Company at 202 North Union Street, is shown in Fig. 1. The gas-fired boiler was set in a pit so that the condensation can be returned to the boiler instead of throwing it away as was formerly done. This boiler displaced a coal boiler and the results have been very satisfactory.

The installation of the gas boiler has eliminated the loss of time used in getting up steam in the morning. The former method took from one to one and one-half hours while with the gas boiler twenty minutes is sufficient.

It has also saved the time formerly required to shovel coal and ashes.

Dust from the ashes is objectionable because it settles on the fresh cement and prevents the repair gums and fabrics from sticking to each other.

Loss of time in constantly watching the water level and steam pressure is also eliminated. In addition to this it has made available for use about 75 per cent of the space required for the coal boiler and coal bin.

The gas fired boiler, therefore, saves labor, increases the quality and amount of work done, increases the

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The Gas Man in His Broader Sphere

Reference is made elsewhere in this issue to a circular issued by the Engineering Experiment Station of the University of Illinois in which the statement is made that, if every householder and owner of a small house-heating plant in the State of Illinois would use reasonable care in the purchase of his fuel and in the operation of his plant, the saving would be equivalent to 4,500,000 tons of coal per year. Applied to the whole country more than 60,000,000 tons would be saved.

The gas man in recent months has learned a great deal in regard to his relation to the people in his community. In the past many doubtless realized that in them and their particular situation were reposed vast potentialities for the public welfare, but these thoughts were kept secret. In the past few months others—outsiders—have come to the gas man to tell him things he already knew, but never expressed openly, in regard to the important position he occupies in his community. They had axes to grind—patriotic axes it might be stated. They wanted to make use of these potentialities represented in him for the benefit of the Nation.

These factors have combined to establish in the gas man's mind the relationship he occupies to the community that supports him; that he is, in effect, if not in name, just as much a public servant as a duly designated public official.

The statements contained in the circular of the University of Illinois suggest an additional means by which the gas man can serve his community without departing too far from his proper sphere, even though directly he cannot benefit to any great degree from the work he does.

The gas man is eminently fitted to serve as an authority on the economical utilization of coal. Heating problems, even as applied to the home, are a subject his daily work has familiarized him with. Why not assume the gratuitous service of preaching and making effective the elimination of this particular brand of fuel waste? The gas man has a personal acquaintance with a large part of his community and has the entree to its homes. The public, due to high coal costs, will lend a willing ear to such teachings.

A direct and immediate reward for our labors in relief from many of our own coal problems is possible if a good part of this waste can be eliminated. The value of such a service to the Nation would be almost beyond calculation.

There is a future advantage to the gas industry as well. The public would come to look upon the gas man as its adviser on heating problems—an honest and non-partisan one, too, since for the present he would seemingly be going contrary to his own interests in making more efficient the utilization of crude fuel for house heating.

But sooner or later, regardless of the efficiency attained in the utilization of crude fuel for such purposes, house heating by gas is going to become almost universal in this country. When the time comes when the advantages of gas so clearly outweigh crude fuels that there can be no question about them, the transition will be simple. The gas man will merely tell the householder that the change is to his advantage and the householder, having full confidence in his motives, will take his word for it.

There will be no need of presenting arguments founded on technical principles, which in nine cases out of ten are not convincing, due to the fact that the person addressed cannot comprehend them, but merely a statement of facts from one who has proved himself a disinterested adviser.

A Hint as to How the Companies Will Be Affected by the Selective Draft

The drawings for the draft have been completed and a real basis established on which gas companies may base estimates as to the drain that will be imposed upon their man power due to military service. It is true that many who are called will be exempted and that numbers of gas men whose names are among the earliest drawn may never be called upon to serve. But there are hundreds of others the companies felt certain would be withdrawn whose numbers are far down on the list and who may never be called up even for examination.

To those who will go the company management should see to it that all honor and consideration are shown.

Make no mistake as to the conscript. In the great bulk he will make a splendid soldier. He has already shown loyalty to those to whom he owed loyalty by waiting for the country to select him, a good indication that in his new role he will show loyalty to the service he enters.

The fact of his having waited for the draft in nowise indicates that he has been unwilling to serve his country to the point of offering his life. He has merely availed himself of the privilege it has offered him of shifting to the shoulders of the Government a responsibility it should have shouldered for its soldiers throughout its whole history.

It is no light thing for a young man, on his own responsibility, to subject his parents to months, perhaps years, of anguished anxiety. It is true that his life is his own; that he may do with it as he will. But it has cost his parents years of sacrifice and effort to bring him up. He owes them an obligation too. The sacrifices of war are not borne by the soldiers alone. In fact, in those of the spirit, they make the least of all.

It is a difficult thing for the young man to decide if he has the right to sacrifice the happiness of his mother while the mother of the young man next door sacrifices nothing. Many in the past have volunteered on impulse and thought of these things afterwards. The young man of the future will not have this unjust burden imposed upon him.

The Government has assumed the responsibility of deciding for him, leaving his mind free from self-recrimination, perhaps, and free and open to assimilate the teachings of his new calling.

The Attitude of the Public Toward Increases in Rates

For months past THE AMERICAN GAS ENGINEERING JOURNAL has been urging upon gas companies the necessity of seeking increased rates for their product. A manufacturer, who continues to sell his product at the same price when the cost of the raw materials he uses has, in some cases, increased as much as four times is manifestly doing business on an unsound basis. We concede something to increased efficiency in manufacturing processes and improved methods but we cannot concede miracles.

Likewise we have contended that with the matter put squarely before it, the public would admit the justice of the increase and the company's action would in nowise lessen good will. This contention is emphatically proved in the following extract from a local newspaper. The name of the paper or of the locality is not given. This comment is but one selected from many as being typical of the whole number. There is a note of discouragement revealed in it; a sense of weariness at the monotony of high prices. The increased demand upon the income of the man of moderate means represents no insignificant item for it has already been strained almost to an unbearable extent.

Yet the justice of the gas company's action is conceded. No complaint is registered since it is appreciated that the gas company too, in these tense times, is contending with price conditions that seem almost unbearable. The extract follows:

> "The increase in the price of gas is a symptom of the high cost of living the effects of which about every family in the community will feel. It is a fairly large increase that has been announced—fifteen cents, or nearly 20 per cent—and will help with the advance in the prices of other necessities to make it harder for people to keep their expenditures within their income.
>
> "Of the details of the cost of manufacturing gas we know nothing beyond what is stated in the letter of the president of the company to the mayor. On general principles, however, corporations are affected by the high cost of living just as individuals are. There is no magic by which a gas company can buy coal at a low price when the price of coal is high. The big company is subject to the same economic conditions that affect individuals.
>
> "Of course, the impression is widespread that corporations are rich, and that there is no need of their raising prices. With particular reference to the gas company, it is known

that a considerable sum of money has been recently spent on a new power station. The unthinking mind is quite apt to take the view that while potatoes and bacon and cotton cloth go up in price as a matter of course, the price of gas and street car fares should be unchangeable.

"The president of the company has written to the mayor: 'I am willing to give any information that you or any city official desires, and we should be very willing to show our figures to anyone to verify the fairness of the increase.'

"We are confident this offer is made in good faith. The company evidently regards the mayor in the light of a representative of all its patrons. In that capacity it would be a good plan for him to take advantage of the company's offer, investigate personally or through others the advance in the price of gas, with a view to confirming the company's statement that it was necessary."

This, then, is the side of the public. There is another side still that the gas company must look at.

Let us assume there is a gas company with stockholders that are willing to forego a return on their investment; that keeping on as it has, and making no increase in the cost of operation, the company can split even despite the high costs of raw materials, and that it fears criticism, even though it be unjust, so much that it prefers to go on temporarily at the same rates, marking time, so as to speak, in the matter of profits.

But what about this company's employees?

They in common with the general public are contending with abnormally high living costs. Perhaps the pinch will be felt even more in the future. There must be some flexibility in the matter of wage standards to enable them to even exist, let alone give them that freedom from personal worries that can alone assure the company that it is getting from them the most efficient service. This flexibility cannot be unless there is also some flexibility in the company's income.

The following suggestions are gathered from a study of experiences in England. THE AMERICAN GAS ENGINEERING JOURNAL is convinced that their observance will be conducive to the best interests of the gas industry in this country.

Wages should be constantly and consistently adjusted to living costs. The workman should be well paid. The expenses of existence to him may rise beyond all previous standards, and it is certain that he will be called upon to expend a vastly increased amount of energy in his task.

Gas companies owe it to their employees to contend for such adjustments in rates as will enable them to follow this course.

The worker, on the other hand, must seek to avoid all differences with his employers; should turn a deaf ear to all arguments as to peace-time rights of labor.

It must be, if we are to fulfill our obligations to the country, a case of give and take on all sides.

The worker must forget all thoughts as to self interest, and the company must see to it that he does not suffer because of the concessions he makes.

Publications

The Production of Sulphate of Ammonia for 1915-1916

Paper-bound bulletin; 16 pages; illustrated with charts and tables. Issued by The Barrett Company, Ammonia Sales Agency Department, 17 Battery Place, New York City.

Discusses status of ammonia industry and gives data in regard to production and demand in the United States and foreign countries. Comments on apparent swing of country towards by-product coke oven and traces progress with past few years.

New Legislation of Especial Interest to Gas, Electric and Water Companies —Massachusetts—1917

Paper-backed pamphlet; 31 pages. Issued by the Board of Gas and Electric Light Commissioners of the Commonwealth of Massachusetts.

Gives particulars of various legislative acts of the nature indicated in title, among them being an act to dissolve certain corporations among which are included several gas companies.

The Economical Purchase and Use of Bituminous Coal for Heating Homes with Special Reference to Conditions in Illinois

Circular issued by the Engineering Experiment Station, University of Illinois, Urbana. Price 10 cents.

If every householder and owner of a small house heating plant in the state of Illinois would use reasonable care in the purchase of his fuel and in the operation of his plant, the saving would be equivalent to 4,500,000 tons of coal. According to the circular such a saving is easily within the range of practical attainment. Applied to the entire United States, intelligent attention in the operation of house heaters would save more than 60,000,000 tons of coal.

The University of Illinois discusses in this circular the more important factors involved in the installation of a satisfactory house heating system, and set forth the most economical methods of firing soft coal and operating a house heating plant. The properties of fuels, and the processes attending their combustion are discussed in a fashion which is intended to help the average householder to understand his problem and to secure the economics of intelligent operation.

Tables giving the trade names, geologic names, and average heating value of the coals of the central western area are contained in the circular and a chart is presented to show the relative worth of coals of different heating values. Some attention is also given to the properties of eastern coals.

Diagrams in color illustrate the usual heat losses which occur and suggest the means to be employed in

overcoming them. Methods and devices for regulating house heaters are shown by drawings, and the importance of proper chimney height, of air-tight flues, and of various dampers and regulators is emphasized by a number of illustrations.

Organizing and Conducting Safety Work in Mines

Technical paper 103, issued by the U. S. Bureau of Mines, Washington, D. C. Authors, Herbert M. Wilson and James R. Fleming. Paper-backed; 57 pages; illustrated.

Describes organization of safety work, education of miners, safety measures, mechanical safeguards, etc. Tables show production, employees and fatalities in coal mines of country from 1896 to 1914; a comparison of accident statistics of leading coal producing countries; ratio of accidental to total deaths, classified by occupations, 1907 to 1910, etc.

Effusion Method of Determining Gas Density

Technologic paper 94 of the U. S. Bureau of Standards, Junius David Edwards, author. Paper-bound, 30 pages; illustrated. Issued by U. S. Bureau of Standards and sold only by the Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 10 cents.

The report on an investigation instituted to discover the sources of error in the effusion method of determining gas densities for use in the measurement, especially of natural gas, and to develop the apparatus and technique necessary to secure the best results.

The contents include: Description of preliminary tests, discussion of the theory of the effusion method, experimental apparatus and methods, effect of experimental conditions upon the apparent specific gravity, recommendations and summary.

The Primary Volatile Products of the Carbonization of Coal

Technical paper 140 of the U. S. Bureau of Mines. A sequel to Bulletin 1, The Volatile Matter of Coal. Authors, Guy B. Taylor and Horace C. Porter. Paper-bound, 59 pages, illustrated. Issued by the U. S. Bureau of Mines, Washington, D. C.

A study of the basic phenomena in carbonization. Contents include discussion of the nature of the problem, a description of the types of coal used in experiments, methods used, distillations to determine ease of decomposition of different coals, distillations of volatile matter at temperatures below 500 deg. Cent., distillations above this temperature, effect of rapid and slow heating, secondary thermal reactions among volatile products, determination of tar and coke, rate of evolution of volatile matter, summary of results of experiments, etc.

Hot Coke Transporter Installed for the Manchester Corporation Gas Department

Paper-bound booklet; 25 pages, illustrated. Issued by Drakes Limited, Halifax, England.

Describes the installation indicated in the title.

Luminous Radiation from a Black Body and the Mechanical Equivalent of Light

Scientific paper 305 of the U. S. Bureau of Standards. Authors, W. W. Coblentz, associate physicist, and W. B. Emerson, laboratory assistant. Paper-bound; 12 pages. Issued by U. S. Bureau of Standards and sold only by the Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 5 cents.

This paper gives applications of the visibility of radiation of the average eye to radiation problems. The problem of particular interest is the relation between visual sensation ("light") and radiant power. The paper gives numerical data on this relation which for practical purposes may be taken as being 1 watt of radiant energy of maximum visibility is equivalent to about 50 candle.

Install Gas Radiator for Electric Company Oven

A gas radiator for a japanning oven of the General Electric Company in Atlanta, Ga., by the Atlanta Gas Light Company, was among the industrial installations made by the gas sales department in June. Others were a specially designed burner for cooking sugar-coated peanuts, and a Vulcan candy furnace, for the Imperial Chemical Company; a gas forge for the Southern Saw Works; and a ¼ HP gas-fired steam boiler for the Adams Dry Cleaning Company. Two automatic water heaters for Wesley Memorial Hospital also were installed.

Shipments of Bituminous Coal for June Show Large Increase over Same Month of Last Year

The following statement of carloads of bituminous coal that originated on 85 railroads and of beehive coke on 16 roads in June, 1917, is compiled from reports received by the U. S. Geological Survey, Department of the Interior, by noon July 16, 1917.

COMPARATIVE FIGURES BASED ON REPORTS FOR JUNE, 1917.

	June, 1917.	May, 1917.	June, 1916.
Number of working days	26	26	26
Carloads of bituminous coal originating mainly in the following districts:			
Central Pennsylvania, Maryland, and New River and Pocahontas fields of West Virginia and Virginia (11 roads)	186,196	186,249	174,164
Western Pennsylvania, Ohio, and Michigan (14 roads)	112,280	110,721	80,425
Eastern Kentucky and West Virginia (except New River and Pocahontas fields) (11 roads)	173,728	173,101	169,176
Alabama, Tennessee and Georgia (5 roads)	13,803	13,287	11,652
Illinois, Indiana, and Western Kentucky (22 roads)	172,335	174,588	93,980
Arkansas, Iowa, Kansas, Missouri, Oklahoma, and Texas (10 roads)	49,627	49,741	34,929
Rocky Mountain States, North Dakota, and Washington (12 roads)	42,353	41,479	30,205
85 roads	750,322	749,166	594,531
Carloads of beehive coke (16 roads)	76,079	75,905	72,731

The increase in these shipments of bituminous coal in June, 1917, was 1,156 cars, or about 0.15 per cent, compared with May, 1917, but was 155,791 cars, or 26.2 per cent, compared with June, 1916. As the three months compared in this statement have the same number of working days, the totals represent the relative changes in rates of production. There were slight increases in June, compared with May, 1917, in the shipments from the eastern and southern fields and from the Rocky Mountain States and Washington. Illinois, Indiana, Western Kentucky, and the Southwestern States recorded decreases. Every district shown had a large increase in June, 1917, over June, 1916, the most notable increase having been in Western Pennsylvania, where in June, 1916, the production was curtailed by labor trouble.

In the early part of June production was at the highest rate of which there is a record, but a falling off in the third week in several States and in the fourth week in others served to lower the average to about equal that of May.

The shipments of beehive coke in June, 1917, increased 0.23 per cent over May, 1917, and 4.6 per cent over June, 1916.

Bituminous Mines of Country Working at 75 Per Cent of Capacity Possible with Present Available Working Force

Figures collected by the U. S. Geological Survey and published in its first weekly coal report indicate that the bituminous mines of the country are at present working to 75 per cent of their capacity possible by utilizing the labor force at present available.

The ratio of tonnage produced to full-time capacity for the 3 weeks ending June 23, June 30, and July 7 for 12 operators associations reporting approximately one-fourth of the tonnage produced in the country are shown in the following table:

PER CENT OF PRESENT FULL-TIME OUTPUT PRODUCED IN CERTAIN STATES BY ALL OPERATORS MAKING WEEKLY REPORTS

State	Per cent of full-time output produced in week ending: June 23	June 30	July 7
Indiana	68.3	69.5	73.0
Illinois	65 9	72.7	78.2
Ohio	70.5	65.5	76.3
Pennsylvania	75.5	72.3	75.4
Eastern Kentucky and Tennessee	63.2	72.8	75.0
United States*	72.9	71.4	76.5

* Embraces twelve associations with a combined production of about one-fourth of the production of the country.

The increase in the percentage of full-time capacity produced from 71.4 for the week ending June 30 to 76.5 for the week ending July 7, is attributed to the fact that the mines were shut down on July 4, and the railroads were therefore able to supply more of the cars ordered for the remainder of the week.

Actual tonnage losses, below full-time capacity, as reported by 6 associations representing approximately one-fifth of the production of the country are shown in the following table.

TONNAGE PRODUCED AND CAUSES OF LOSS.

Week ended	Full-time weekly capacity	Actual Production (net tons)	Losses, all causes (net tons)	Per cent of full-time output Produced	Lost
June 23	2,059,327	1,495,272	564,055	72.5	27.5
June 30	2,175,287	1,516,267	659,020	69.7	30.3
July 7 (5 day week)	1,780,024	1,335,861	444,163	75.0	25.0

PER CENT OF FULL-TIME OUTPUT LOST ON ACCOUNT OF:

Week ended	Car shortage	Blocked loads	Labor trouble and shortage	Mine disability	No market	All other causes	No cause given
June 23	20.4	0.1	3.2	2.7	—	0.2	0.9
June 30	21.0	0.1	4.5	3.2	—	0.1	1.4
July 7	12.2	0.1	6.5	4.2	—	0.2	1.8

Domestic Consumption of Sulphate of Ammonia in England Shows Increase

According to the report of the British Alkali Committee, the production of sulphate of ammonia and equivalent in the United Kingdom in 1915 was 426,267 gross tons, practically the same as in 1914

The consumption for 1915 was 131,000 gross tons, including agriculture, ammonia soda and munitions uses, which is 25,000 tons more than was used in 1914, but less than the estimate for 1916, 178,000 tons. This increase is largely due to the manufacture of explosives in both years, although no exact data is available on this point.—*The Barrett Company Bulletin an Sulphate of Ammonia Production for* 1915-1916.

News of the Gas Industry

F. P. Grosscup Elected President of West Virginia Natural Gas Association at Recent Annual Meeting

About a Thousand in Attendance at Convention—Representatives Included Many Eastern and Central States

The second annual convention of the West Virginia Natural Gas Association opened July 11 at Shattuck Park in Parkersburg, W. Va. About a thousand gas men were present, representing several eastern and central states.

In the afternoon of the closing day, July 13, the following officers were elected: President, F. P. Grosscup, of Charleston; vice-president, E. G. Davidson, of Crawford; secretary and treasurer, Edwin Robinson, of Fairmont; and the following four members of the board of directors: George B. Riddle, of Wheeling; Patrick McDonough, of Parkersburg; E. J. King, of Huntington, and Lynn S. Horner, of Clarksburg. Next year's meeting will be held at Huntington.

Brockton, Mass., Company Raises Rates

The Brockton Gas Light Company of Brockton, Mass., has increased its rates from $1.15 to $1.25 per 1,000 cu. ft.

New Jersey Gas Standards Hearing Comes to End

The hearing of the Public Service Corporation of New Jersey before the Public Utility Commission of that State regarding the lowering of the heat unit requirements came to an end July 19. A decision on the application is expected within a short time.

Pennsylvania Gas Company Increases Erie Rates 13 Cents Per Thousand Cubic Feet

The Pennsylvania Gas Company has increased the city rate for natural gas at Erie 13 cents per 1,000 cu. ft.

THIS GROUP COLLECTED TOLL ON THE ATLANTIC CITY AND CAPE MAY HIGHWAY NEAR THE COMPANY'S PLANT

Safety Director Henry Kessler of the city after announcing the increase stated that the company in making out the new bills has eliminated the 25 per cent discount formerly allowed the city and in addition to that has added 5 cents per 1,000 cu. ft. increase.

Under the old discount rate the city paid 24 cents per 1,000. Under the new rate it is paying the same as individual consumers, 37 cents per 1,000 cu. ft.

Manitowoc, Wis., Company Asks for Increase in Rates

The State Railroad Commission of Wisconsin has been petitioned by the Manitowoc Gas Company of Manitowoc for permission to increase its rates.

West Virginia Company Wants Permission to Increase Rates

The Public Service Commission of West Virginia recently heard the application of the United Fuel Gas Company to increase its gas rates in Kanawha, Putnam, Wayne and Cabell counties.

Gas Lighting Scores a Triumph Over the Talking Machine

Keen Rivalry Displayed in Contest Waged to Secure Red Cross Contributions by Teams of Welsbach Company and Victor Talking Machine Company—Campbell's Soup Also Competes

Though a triumph over the talking machine does not carry the degree of satisfaction to the gas lighting man that one over electric lighting does, the employees of the Welsbach Company are considerably elated over the success of their Red Cross Campaign team which collected almost double the allotment assigned to it for the Red Cross, incidentally winning out, in amount secured, over the teams of the Victor Talking Machine Company and the Campbell Soup Company.

General Manager Stites of the Welsbach Company captained the team for Gloucester City in connection with Camden County's Red Cross Campaign Week, and was assigned the task of collecting $11,000 from the town's population of 10,000

THESE LADIES HELPED TO GET RED CROSS DOLLARS FROM ALL THE GLOUCESTER, N. J., HOMES AND STORES

working people. His team made doubly good by turning in $21,533.00, a per capita contribution of $2.15, exceeding the town's allotment by 96 per cent, thereby winning first place against two dozen competitive teams, including the Victor Talking Machine and the Campbell Soup teams. The teams of the three big nation-wide advertisers—Welsbach, Victor, Campbell—finished in the order named.

Captain Stites says that Gloucester City is proud of its local victory, but Gloucester is not willing to stop there, and claims that Gloucester City is in first place in the percentage of excess in its contribution over its allotment and its per capita contribution based on per capita wealth over any and all cities, towns or boroughs throughout the entire United States.

Mr. Stites, as captain, organized the Gloucester team and laid out the details of the campaign. A poster was originated and displayed all over the town. A folder, setting forth the reasons why Americans should give up their dollars for the Red Cross, was issued by the Gloucester team and distributed to every house and store. Big canvass banners were hung across the streets in the Welsbach Plant.

The closing day of the campaign developed something in the nature of a whirlwind finish as the race between the Welsbach and Victor teams was seen to be a close one. The Victor team employed every imaginable means of enlarging its contribution. But the Gloucester people themselves kept pouring in the money that landed them in first place.

The final effort on the part of Mr. Stites' team was in the form of a Red Cross dance held on the roof garden of the Welsbach plant. This event proved to be an impressive spectacle. An enormous, illuminated Red Cross was elevated over the roof garden. The big flag over the main office was flood lighted and gave a truly startling effect of floating brilliance against the night sky. This festive and colorful scene high in air attracted attention and occasioned favorable comment for miles up and down the Delaware.

The Welsbach Factory employees also have a record on Liberty Bonds, having subscribed for $66,000 worth.

Only 85 Properties in Bridgeton, N. J., Not Served With Gas

At the annual meeting of the stockholders of the Bridgeton, N. J. Gas Light Company, President Minch showed that every property in Bridgeton, with the exception of eighty-five was being furnished with gas and that the company's mains embraced every street in the entire city. This is quite unusual.

Much of the discussion in the shareholders' meeting was concerning the present serious business problems which are perplexing the directors and management and giving them great concern.

Coal costs are so excessive together with the other supplies, and deliveries are so uncertain, that the service given by the company to the public is accomplished only with the greatest difficulties. The higher costs have practically wiped out the margin between expenses and profits and there is no relief as yet in sight. The stockholders, through the frank statement of the officials, thus obtained a closer and more intimate viewpoint of the serious problems that confront the corporation.

Following the meeting of the shareholders, the directors organized with the election of B. H. Minch, president; Samuel P. Fithian, vice-president; Wm. C. Mulford, secretary and auditor, and B. F. Harding, treasurer.

New Connection Service Charge in Indiana Company Petition

The Citizens Gas Company, of Indianapolis, has filed with the public service commission a petition, asking that a supplemental schedule of rates and rules be approved by the commission, the main point being a proposed increase in the charges for connecting new customers to the mains of the company, made necessary by the tremendously increased cost of iron pipe. The extraordinary increase in labor costs has not been figured by the company in its proposed increased charges, its officers said informally, but only the cost of iron pipe is sought to be covered. Formerly the charge for laying pipe ran from 15 cents a foot to 25 cents a foot. The new schedule would increase it to 30 cents to 45 cents, with additional higher costs for larger pipe.

The proposed new schedule, apparently, is to take the place with the Citizens' company of the petition for a surcharge from other companies in the Indiana Gas Association, the Citizens' company not being a part of the association in so far as the petition for a surcharge is concerned.

The proposed new schedule, which includes a new form of contract for connecting service, follows:

Applicants for gas connection service from property line to the meter will be required to sign an application as follows:

Indianapolis, Ind.,——191—.

I hereby make application to the Citizens Gas Company of Indianapo-

lis, to lay a service pipe for the supply of gas to premises No..... of which I am tenant. owner. I agree to pay said gas company for laying such service pipe to the meter location, at its regular schedule of charges as printed on the back hereof. I further agree that such service pipe shall at all times be subject to control, rules and regulations of said company. Address..... Kind of building..... Accepted for the company..... Deposit on above order $.....

No change may be made in the printed form of this contract.

Acceptance of this order by the company does not bind it to extend its mains or install the service if local conditions render it impracticable to do so. In such event any deposit made by the applicant will be refunded.

CHARGES FOR SUCH SERVICE

Charges will be made on the actual length of pipe used as follows:
For pipe not over

1¼ in. in size	.30 cts. per ft.
For 1½ in. pipe	.35 cts. per ft.
For 2 in. pipe	.45 cts. per ft.
For 2½ in. pipe	.60 cts. per ft.
For 3 in. pipe	.75 cts. per ft.
For 4 in. pipe	.$1 per ft.

A minimum charge of $7.50 will be made for laying service pipe, and a minimum charge of $5 each for laying two or more service pipes within a single city block at the same time for the same person.

Additional charges will be made for digging through high embankments or for other conditions involving unusual expense in installing the pipe.

The above charges are based upon the estimated amount of the actual cost of service.

Deposit will be required equal to the estimated cost of the service, and any portion not consumed will be returned to the applicant.

Ten New Jersey Gas Companies Merged

Subject to certain conditions named in its order, the State Board of Public Utility Commissioners of New Jersey, has approved the application of several gas companies for permission to reorganize under the name of the Cumberland Gas Company.

The new company will take over the property and business of the Millville Gas Light Company, Citizens' Gas Company of Landis Township, Citizens' Gas Light Company of Vineland, Commercial Gas Company, Maurice River Gas Company, Downe Township Gas Company, Lawrence Gas Company, Fairfield Gas Company, Deerfield Gas Company and Pittsgrove Gas Company.

BALTIMORE COMPANY PUSHES PRESERVING CAMPAIGN IN ITS NEWSPAPER ADVERTISING

Society of Gas Lighting Members Meet on Staten Island

The July meeting of the Society of Gas Lighting was held at the Richmond County Country Club, Staten Island, N. Y., on Thursday, July 12. Among those present were: A. E. Forstall, president of the American Gas Institute; William H. Bradley, chief engineer of the Consolidated Gas Company of New York; Dr. E. G. Love, chief chemist of the same company; James F. Hunter, assistant chief engineer of construction; W. F. Lawrence, engineer of the Astoria plant; Colonel Benson, retired chief engineer of the Brooklyn Union Gas Company and president of the Society of Gas Lighting; Robert W. Bush, chief engineer, and E. C. Uhlig, chief chemist of the Brooklyn Union Gas Company; George T. Macbeth, chief gas engineer of the Westchester Lighting Company; A. H. Strecker, consulting engineer of the Public Service Corporation of New Jersey; George G. Ramsdell, secretary of the American Gas Institute; W. McDonald, ex-president of the Western Gas Association and president of the D. McDonald Meter Company of Albany, N. Y., and William J. Welsh, president and general manager of the New York and Richmond Gas Company.

Belleville, Ill., Company Wants 85 Cent Rate for Natural Gas

The Belleville (Ill.) Gas Company, supplying natural gas to that city has applied for a rate of 85 cents per 1,000 cu. ft. before the Public Utilities Commission of Illinois. Until the company tapped the natural gas field at Staunton, Ill., Belleville had been supplied with manufactured gas at $1.25 per 1,000.

May Ask Rate Increase at Easthampton, Mass.

The necessity of obtaining an increased rate on account of the excessive cost of materials was brought out at a recent meeting of the Board of Directors of the Easthampton Gas Company.

State Commission Approves Worcester, Mass., Company's Rate Increase

The Worcester (Mass.) Gas Light Company has secured approval of the State Gas & Electric Commission of its increase in price of 10 cents per 1,000 cu. ft.

Increase in Price of Gas in Massachusetts

A number of gas companies in Massachusetts, and two municipal gas plants, have raised their rates from 5 to 50 cents per thousand feet. Most of these increases have taken effect, a number of them on July 1. The following are the companies and plants which have announced increases in prices:

Worcester Gas Light Company	75 to 85 cents
Springfield Gas Light Company	85 to 90 cents
New Bedford Gas & Edison Light Company	80 to 95 cents
Malden & Melrose Gas Light Company	90 to 95 cents
Suburban Gas & Electric (Revere)	90 to 95 cents
Cambridge Electric Light Company	80 to 90 cents
Amesbury Gas Light Company	$1.50 to $2.00

Citizens' Gas Light Company (Quincy)	$1.10 to $1.20
Ware Company	1.50 to 1.75
Holyoke Municipal Plant	.90 to 1.00
Westfield Municipal Plant	1.00 to 1.25

The Pittsfield Company has reduced the discount for prompt payment from 10 to 5 per cent. Increases announced by the Malden & Melrose and the New Bedford companies are effective Aug. 1.

The gas commissioners' office, with which the increased rates are filed, states that a number of protests have been received by letter and telephone relative to the advance in prices, but in only one company's territory, that of the Amesbury Company, has a formal protest been filed thus far. Only a formal complaint, signed by the mayor of a city or the selectmen of a town, or by at least 20 citizens, has claim to thorough going investigation by the commission. In default of this, a rate fixed by the companies stands.

In most of the companies noted above slight opposition to the increased rate has been offered, it being recognized, as explained by the gas companies, that the enormous increase in the cost of fuel, oil, etc., makes an increase in the price of their product inevitable. In any case the company shares the burden with the consumer despite the additional price charged for the gas.

Government Begins Issue of Weekly Coal Report

Weekly statistics showing what the soft-coal miners of the country are doing, and why they are not doing more, are now being collected by the United States Geological Survey under Secretary of the Interior Lane.

In submitting the first weekly report to Secretary Lane and the Coal Committee, Director Smith of the Geological Survey states that what has been accomplished in the six weeks since this statistical effort was begun, is largely due to the patriotic and prompt co-operation offered by the coal-trade associations' secretaries and the operators, whether members or non-members of associations.

These figures from all sources are reduced to a comparable basis by a force of statisticians under C. E. Lesher, of the Geological Survey, with the immediate purpose of showing what factors in each district are limiting production and shipments. With this information before it, the Committee on Coal Production is able to concentrate its efforts where the greatest stringency lies—whether, as in most localities, the trouble is lack of cars, or whether it is labor shortage.

The operators realizing that their interest lies in having this information promptly available, their support of this work, although it involves additional labor on their part, has been prompt and hearty.

The first figures available give a comparison of the first week of July with two weeks of June and are those furnished by the already organized trade organizations, which represent about 25 per cent of the production of the country. Some of the important producing districts, particularly Alabama, West Virginia, parts of Pennsylvania, Ohio, and the territory from Texas to Iowa, figures from which are not shown in this first statement, are being rapidly organized for this purpose and have already furnished partial information. The weekly reports that will follow hereafter will include successively greater tonnage and be more representative of the total.

The districts covered by this statement are distributed over a large producing area and are indicative of what is happening in the coal-mining industry. A more general idea of the total production, but without indication of the causes of the loss of working time at the mines, will be found in the monthly bulletins issued by the Geological Survey, which are based on the daily, weekly and monthly reports furnished by railroads originating more than 85 per cent of the coal production of the United States, which bulletins are in no way supplanted by these weekly studies of the particular causes hampering greater output at the mines.

For the three weeks reported, it will be noted that the average loss was fully one-half million tons which would indicate that the weekly output of mines of the whole country is not less than two million tons below full-time capacity. By far the greatest factor concerned in the losses was the inadequate car supply. Thirty-one per cent of the total full-time capacity of these representative mines was lost because the supply of cars at the mine mouth was insufficient. Other important causes were labor deficiency, crippling the industry to 4.5 per cent of its full-time capacity, and mechanical breakdowns within the mines to which losses amounting to 3.2 per cent of the full-time output were attributed. No mines reporting to the Geological Survey mentioned losses because of no market for their product.

Taunton, Mass., Company Elects Directors for Coming Year

At the recent annual meeting of the Taunton Gas Light Company the following directors were re-elected: William C. Davenport, Frank L. Tinkham, John E. Browne, Charles W. Davol and Walter T. Soper. Mr. Soper was re-elected secretary and treasurer. The reports for the year were read and accepted. At the meeting of the directors William C. Davenport was chosen for another term as president.

Gas Company Exhibits Connected Apparatus

An interesting feature of the appliance salesroom of the Beverly (Mass.) Gas & Electric Company is the exhibit of gas water heaters in the basement showroom, where is also a specimen all-gas kitchen, comprising the complete equipment of a modern kitchen. All the apparatus in both exhibits is connected to the company's services, and is available for practical demonstrations at any time.

The water heater exhibit consists of a No. 30-40 Ruud storage system heater, a Ruud automatic No. 4 and a Vulcan tank heater.

The gas kitchen equipment comprises a No. 70 Ruud cottage range, a Vulcan range, gas flatiron and gas lighting fixtures.

The Beverly company had a strong run on Vulcan tank heaters earlier in the season, about 100 being sold in one week.

The stove and appliance department is in the hands of C. B. Hodgson.

The company's policy with respect to sales of appliances is contained in instructions to salesmen which prescribe that the latter inform themselves thoroughly on all goods offered, and "give the prospective customer all possible advice and information as you would your best friend. Always try to sell a customer what you honestly believe it is for his interest to buy; never consider the profit the company will make on the article sold. . . . If you

lose a customer by giving him facts which lead him to believe that he cannot afford to use any given piece of apparatus, you have made a friend; if you sell him without giving him the facts, he will find them out later, and you will have made an enemy. One satisfied customer is worth more than a dozen dissatisfied ones."

The present company completed thirty years of history about a year ago, but the gas company dates from 1859, when it organized with $40,000 capital stock. The rate for gas was $5 per 1,000 cu. ft. in 1864-69. The present price is $1.10 net.

$2,360,000 Paid for Buffalo Gas Company

Louis Gethoefer, former Buffalo banker, who is now president of the Pittsburgh Trust Company of Pittsburgh, purchased at public auction, July 16, the bonds of the Buffalo Gas Company for $2,360,000. This price will allow the holders of the bonds to realize 40 cents on the dollar upon their holdings.

The face value of the bonds was $5,900,000. The bid was accepted by Carlton Ladd, who was the special master appointed by the United States District Court in the foreclosure of the New York Trust Company for the benefit of the bondholders. In settling the matter the court directed that the bonds be sold at a figure that would allow holders to realize at least 40 per cent on the sale.

Louisville Company Arranges for Entire Output of Mine

In order to take care of its fuel problems the Louisville Gas & Electric Company has arranged for the output of a mine at Render, Ky., 112 miles from Louisville on the Illinois Central Railroad, and has made a contract with the Pullman Company for 25 steel cars to be delivered in September.

The mine belonged to the McHenry Coal Company. It will be operated by the Render Coal Company, and the Louisville Gas & Electric Company will take the entire output.

It is understood that active mining operations have been started, and by January the mine capacity is expected to reach 8,000 tons monthly. The output during the next few months will be stored for the winter.

Design Gas-Coal Furnace with Special Purpose of Eliminating Wastefulness Usually Associated with Such Furnaces

Based on Principle of Long Fire Travel for Gas and Short Fire Travel for Coal—Gas Furnace Separate from and Surrounding Coal Furnace

By F. R. HUTCHINSON

Sales Manager, Gas Appliance Company, Cleveland, Ohio

Anthracite and bituminous coal and coke were very high in price and somewhat difficult to promptly secure last winter.

The condition may, and probably will, be as bad or worse this winter.

Artificial gas, usually available in practically unlimited quantities, is even under such conditions generally higher in price than solid fuels as an all-winter fuel for house heating.

Natural gas, low in cost, much less expensive when properly used than solid fuels, but somewhat unreliable in supply in most communities during severe weather, when most needed.

This fuel situation prompted the construction of a house heating furnace to burn both or either coal and coke or gas.

An investigation of those furnaces said to burn both fuels disclosed the fact that most of them were manufactured by coal furnace builders.

All were found to be of average efficiency as coal warm air furnaces go, and entirely suitable for solid fuel, but wastefully extravagant where gas was employed.

Apparently each furnace was constructed primarily as a coal, secondarily as a gas furnace.

Coal furnaces have a very short fire travel, necessarily, to provide draft for the burning of coal, usually from 5 to 12 ft.

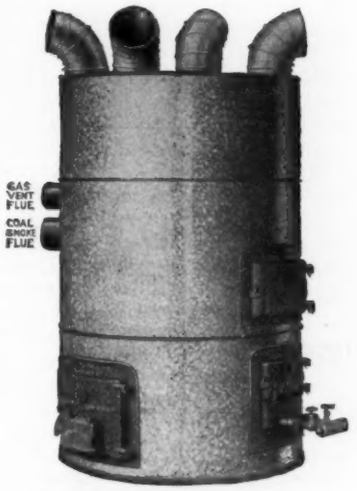
Gas-designed furnaces contain from 20 to 40 ft. of fire travel.

No matter, therefore, how perfect and efficient a gas burner may be, installed in a coal furnace, much of the heat escapes up the chimney, because of the short fire travel.

Coal furnaces equipped with gas burners range in efficiency from 33⅓ to 45 per cent, gas furnaces from 60 to 75 per cent.

With these facts in mind we concluded to construct two furnaces, one for coal, one for gas and enclose them in one jacket or casing.

The necessity was obvious to have a short fire travel for coal, a long one for gas; each separate and distinct from the other so coal or gas might be separately or jointly used.

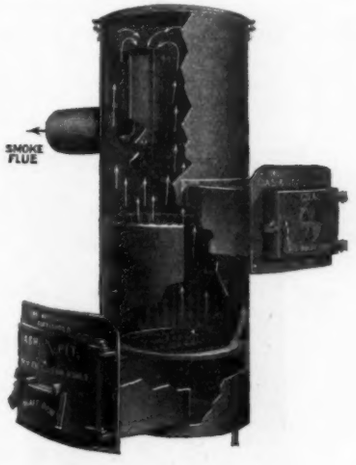


You will observe it is provided in front with coal and gas fire doors, at side with ash pit door and in rear with two flue outlets, one each for coal and gas.

The casing contains two units, an economical gas furnace, an efficiency coal furnace of equal capacity.

Gas, or coal or coke can be burned separately or together.

Within the same casing there are separate fire pots, radiators and flue outlets for coal and for gas, one having no connection with the other,



and each unit of carefully designed construction for the most efficient use of the two fuels.

The Coal Furnace

The coal furnace is of standard construction and suitable for the use

of hard or soft coal, coke or wood.

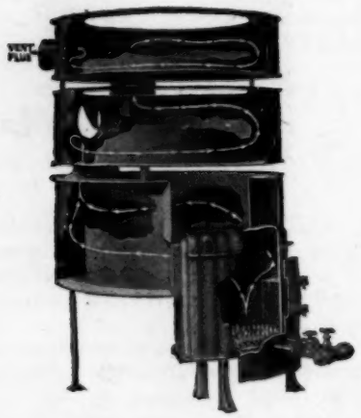
It may also be used as a rubbish burner.

The triangular bar grates may be removed through the ash pit door opening.

The firepot is of heavy cast iron, made in sections, and, in case renewal is required after years of service, replacement may be made through the fire door.

The radiator is of heavy steel plate and all parts have been carefully designed to give strength, efficiency and ease in operation.

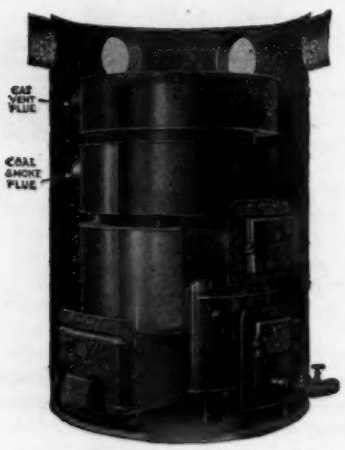
Openings are provided in fire door



for the insertion in the fire pot of a coil for heating water, for bath and other domestic purposes.

The Gas Furnace

The gas furnace is entirely separate from the coal furnace and, when installed, it surrounds the coal furnace as indicated in illustration following:



The gas furnace has a corrugated cast iron burner pot, to assure durability, the burner pot surrounding two powerful cast iron drilled burners.

From the burners, the products of combustion pass through the burner pot and into the three radiators above it, encircling each radiator on their way to the vent flue.

In this manner the long fire travel which is so necessary to secure "high efficiency" in the use of gas is secured.

The radiators are made of heavy rust resisting iron, each joint and seam tightly made to prevent any possibility of the escape of burned gases into the warm air chamber.

With the introduction of this furnace in a home, but little fear need be experienced in keeping warm for each of several fuels may be used.

If operator has difficulty in procuring solid fuel of any kind, gas is available and vice versa.

Manufactured gas sold at thirty-five cents a thousand about equals coal at ten dollars a ton when used through this furnace for All-winter heating.

Many companies distributing artificial gas would prefer not having an All-winter load in large quantities, because of the probable additional investment in plant and mains to care for addition to present Christmas peak.

The higher rate charged for gas by such companies, say fifty cents per thousand or more, would automatically prevent All-winter heating.

In such localities, patrons would probably employ manufactured gas Spring and Fall and during mild Winter days, coal or coke at other times.

To these companies such a load is ideal to help level their curves, and increases sale of gas tremendously, for consumption will average, even in comparatively mild weather with outside temperature at or above 35 deg. Fahr., from 50 to 100 cu. ft. of gas per hour.

In districts supplied with natural gas the need is even more great than where artificial gas is sold.

Because of the high price and uncertain deliveries of coal and coke last Winter, thousands of homes, previously using solid fuel, turned to natural gas for heat.

This enormous, unexpected demand, in most cities, so taxed both production and pipe-line capacities that there was not sufficient natural gas to thoroughly warm their homes.

The convenience and cleanliness of natural gas, of course, lends an appeal to users even though in normal times, price equals or exceeds solid fuel.

Natural gas, sold at forty cents per thousand and used in a wasteful way, through so-called "Combination" furnaces or through burners of any kind installed in coal furnaces, costs with ordinary care, at ratio of coal at about seven dollars and fifty cents a ton.

Coal last Winter sold in many cities at a higher price than this.

Used through gas-designed furnaces, natural gas at forty cents, costs at ratio of coal at about five dollars a ton.

In most districts where natural gas is distributed there are about two hundred heating days.

Supply was interrupted at an average of not more than ten days.

With the Dual Fuel Furnace, natural gas could therefore be used 95 per cent and coal 5 per cent of the time without inconvenience to consumer except for bother and annoyance of shoveling coal and hauling ashes.

This new furnace has a large field of usefulness and gas companies, architects and builders can profit by further investigating its many interesting points as it applies to their local needs.

Personal Notes

Carl Frisk of the hotel and restaurant department of the Detroit City Gas Company, Detroit, Mich., was called for Red Cross ambulance duty and expects to leave for France shortly.

Grover Murphy has recently been appointed inspector of buildings by the Utica Gas & Electric Company, Trenton Falls, N. Y. Mr. Murphy was formerly with the Remington Arms & Ammunition Company.

Oliver McVicar of the hotel department of the Detroit City Gas Company, Detroit, Mich., has joined the colors and is now on the battleship Kansas.

Charles B. Hanley, salesmanager of the Nashville (Tenn.) Gas & Heating Company, died July 13, 1917. Mr. Hanley started with the Nashville Company about nine years ago in the new business department, and since that time has

GROUNDS ABOUT PLANT OF GAGE COUNTY GAS, LIGHT AND POWER COMPANY, BEATRICE, NEB.—THE WELL-KEPT APPEARANCE OF THESE GROUNDS HAS GIVEN RISE TO MUCH FAVORABLE COMMENT

had several promotions, finally reaching salesmanager. He was a graduate of the University of Quebec and of Harvard University.

HUNTLEY ABBOTT has recently resigned his position as vice-president and chief engineer of the MacArthur Concrete Pile & Foundation Company, and is now with the Bartlett-Hayward Company of Baltimore, Md.

THE CINCINNATI (OHIO) GAS TRANSPORTATION COMPANY at its recent annual meeting re-elected H. W. Lotham president, and C. F. Windisch vice-president.

B. C. OLIPHANT, president of the Iroquois Natural Gas Company, Buffalo, N. Y., at a recent Rotary Club luncheon in Buffalo, spoke on the Production and Distribution of Natural Gas, presenting motion pictures in connection with his talk.

H. G. MILLER, purchasing agent of the Granville (Ohio) Fuel & Light Company for the past twenty-five years, died recently.

JOHN J. FLAUTT, who has been with the New Orleans, (La.) Railway & Light Company for the past twelve years in the commercial department, has recently been promoted and is now salesmanager.

RUTHERFORD DEARMON and DONLEY PARR of the Dayton (Ohio) Gas Company left recently with the Marietta College unit for the French front.

JAMES R. RICHARDSON, formerly assistant treasurer of the Columbia Gas Company, died recently at his home in Cincinnati.

H. C. CUMMINS, formerly assistant general manager of the Northern States Power Company, is now at the Chicago office of H. M. Byllesby & Company.

J. G. HART, formerly with the Public Service Company of Northern Illinois as engineer, is now general manager of the North Shore Gas Company, Waukegan, Ill.

THE EMPIRE GAS & FUEL COMPANY, Denver, Colo., was recently incorporated, and R. J. Bardwell was elected president and E. H. McCombs, secretary and treasurer.

W. E. MOORE has been appointed district salesmanager for Central New York by the Hoffman Heater Company and will make his headquarters in Syracuse. Mr. Moore was formerly with the Syracuse (N. Y.) Lighting Company in the new business department.

WILLARD S. OSBORNE was recently appointed superintendent of the Palmyra, N. Y., branch of the Empire Gas & Electric Company. He was formerly connected with the Seneca Falls, N. Y. branch.

MERRILL F. SANDS was recently appointed general superintendent of the Key West (Fla.) Gas Company.

L. B. LOVELL is now salesmanager of the Adams (Mass.) Gas Light Company, succeeding J. Seymour Bush.

J. S. CONNELLY, president of the Port Arthur (Tex.) Gas & Power Company, has consummated a deal disposing of his interests in the company to the P. W. Brooks Company of New York. He will be succeeded by F. E. Newberry. Mr. Connelly's connection with the company will terminate as soon as legal formalities have been complied with, which will be in about a month. Mr. Connelly has interests in several Southern properties, one of which has recently purchased an ice and electric business, and this new business will take up about half of his time.

L. E. SPEAR, formerly with the Springfield (Ill.) Railway & Light Company as new business manager, is now with the Humphrey Water Heater Company. Mr. Spear was with the Humphrey company prior to going with the Springfield company.

L. E. THOMPSON, superintendent of the Utica (N. Y.) Gas & Electric Company is now in training at Madison Barracks, having obtained a commission as Second Lieutenant in the U. S. A. Reserve. Mr. Thompson was presented with a very fine traveling bag, containing military fittings, upon taking leave of his associates in the company.

W. H. EGNOC has been appointed superintendent of the Albion Gas Company at Medina, N. Y., succeeding Thomas Hunt.

LINCOLN BEERBOWER, manager of the Enid (Okla.) Electric & Gas Company, is one of the twenty-five charter members of the newly organized Rotary Club.

D. C. GREEN, manager of the Fort Smith (Ark.) Light & Traction Company has been made a member of the committee which will confer with Major Wood in reference to having one of the army cantonments located at Fort Smith.

Construction Notes

Piqua, Ohio, Company Moves Into New Quarters

The transfer of the office of the Miami Valley Gas & Fuel Company to new quarters in the Third Piqua Building & Loan Building at North Wayne Street was made recently.

The new office quarters are very attractive and arranged for the convenience of patrons.

Beverly, Mass., Company Erects Fence to Keep Trespassers Off Its Property

A six-foot board fence is to be erected by the Beverly Gas & Electric Company of Beverly, Mass., on its River Street plant extending along the property line from the power and light station to Webber Avenue.

This will serve to keep trespassers off the property. The company also expects to start work very shortly in making repairs about the purifying plant which was damaged by fire last winter.

East Ohio Company to Lay 15 Mile Ten-Inch Main

The East Ohio Gas Company has been authorized by the State Department of Public Works to lay a ten-inch gas main along the slope of the canal towpath, between Newburg, a suburb of Cleveland, and Peninsula, a distance of fifteen miles.

Walnut Grove, Okla., Wants Gas Service

Citizens of Walnut Grove have petitioned the State Corporation Commission to require the Oklahoma City Gas & Electric Company to establish a reduction station and lay a pipe line to supply Walnut Grove with gas.

Desire to Take Up Pipe Lines Near Wellsville, Kans.

The Wright Producing & Refining Company of Tulsa has applied for permission to take up certain gas pipe lines near Wellsville, Kan. The application is being contested by various consumers.

Could Have Made 100 Per Cent Profit on Steel for Holder Being Erected at Eau Claire, Wis.

Work is being rushed by the Wisconsin-Minnesota Light & Power Company at its plant at the junction of the Eau Claire and Chippewa Rivers. One-third of the excavation for the holder has been made and forms are being erected for the concrete foundation. It is expected that the holder will be completed in sixty days as the steel is already on cars en route to Eau Claire.

An interesting feature of this improvement is that the company has received an offer of 100 per cent profit on the steel it is using in the holder if it should be willing to sell.

Brick work has already been started on the extension of the bench house, which will shelter four benches.

Desire to Extend Mains to Monterey Park, Outside Los Angeles City Limits

The Los Angeles Gas & Electric Corporation has asked permission of the State Railroad Commission to extend its mains to Monterey Park, outside the city limits.

Grand Rapids, Mich., Company's New Building Nearing Completion

Work on the new building of the Grand Rapids (Mich.) Gas Light Company at Division Avenue, just north of Monroe Avenue, is nearing completion and by August 1 it is expected the company will be installed in its new quarters.

The first floor will be occupied by the business offices and showrooms, and the second floor by the clerical staff and parlors for women employees. The executive offices will be on the third floor. Work shops will be in the basement.

The company has been in its present quarters on Ottawa Avenue and Pearl Street, N. W., for about twenty-five years. The Kelsey-Brewer Company, who own the building will have it remodeled into a modern structure. This work will begin as soon as the gas company vacates it.

North Shore Gas Company Starts Work on $40,000 Improvement at Waukegan

Improvements to cost approximately $40,000 have been started by the North Shore Gas Company at its Waukegan, Ill., plant. The new equipment will directly double the company's present output and is to be made at its South plant.

Some months ago announcement was made that several coke ovens would be installed at the new north plant, but investigations showed that it would take some time to secure the necessary equipment. The South plant manufactures water gas exclusively and the addition, upon which work has been started will have a capacity of 2,000,000 cu. ft. of gas per day. There are already two water gas machines installed at this plant.

The installation of the new water gas equipment does not indicate that the additional work at the North plant has been discontinued, but this plan is to be taken up as soon as possible.

The present improvement is merely to provide for any contingency that may occur.

The new gas-making machinery is to be placed in the old retort house of the South plant. Up to a short time ago coal gas was manufactured in this building.

It will be necessary to remove the roof and build the walls up higher to accommodate the new equipment. It is on this work that a local contractor has already started.

Pacific Public Corporation Bid for Healdsburg, Cal., Gas Service Accepted

The Board of Trustees of Healdsburg, Cal., has accepted the bid of the Pacific Public Corporation for the installation of gas service in that city.

Petition Franchise to Lay Gas Line Along State Aid Roads Between Vincennes and Olney, Ill.

The Illinois Gas Company has petitioned the Board of Supervisors of Lawrenceville for a franchise to lay and maintain a gas line along State-aid roads between Vincennes and Olney, Ill.

There is a line along this highway at the present time, but the company is desirous of putting in a new line to replace the old one and, under the law, must get permission from the Board of Supervisors.

The franchise was granted upon such terms and conditions as the State Highway Commission might prescribe.

To Erect Two Holders at Porterville, Cal.

The California Gas Company is about to purchase a site for a new auxiliary plant to be erected at Porterville, Cal., for the distribution of natural gas. Two gas holders, one of 245,000 ft. and another of 1,000,000 cu. ft. capacity are held near San Francisco, knocked down, awaiting shipment.